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# Agriculture

Volume LXVI Number 12



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












































































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# Agriculture

Volume LXVI

Number 12

March 1960

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THE MINISTRY OF AGRICULTURE, FISHERIES AND FOOD  
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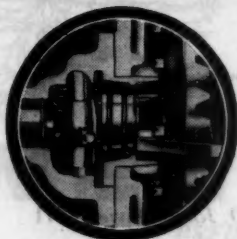
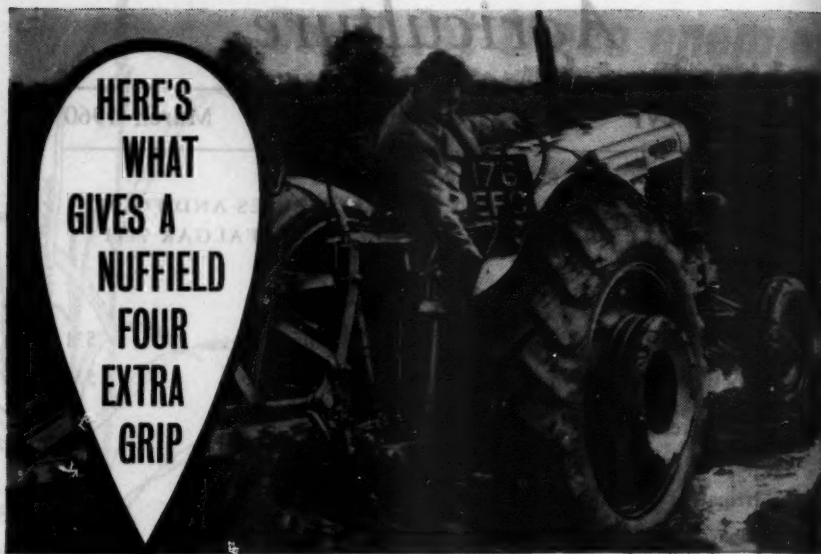
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# Current Trends in Cattle Breeding

STEPHEN WILLIAMS, M.Sc., N.D.A.

*General Farms Manager, Boots Farms, Thurgarton, Notts*

Scientific methods of breeding, linked to the electronic computer, may bring great changes in our cattle, and perhaps even a "standard" cow. But there will still be a place for the private breeder's knowledge and intuition.

COMMENT and advice were never so freely offered to the cattle producer as at present. Almost every week something new is suggested that the breeder should incorporate into his business. There is a feeling of urgency about, yet cows still calve once a year and a generation of cattle spans several years.

A pedigree herd lasts for about fifteen years—perhaps three generations—and its progress in that period still depends on the merit of the foundation cows and the five or six bulls used. During this time many breeders make no progress at all in increasing the intrinsic value of their herd, yet a few with a flair seem to disregard most of the rules and make a tremendous contribution to it. These successful breeders know their own cattle very well indeed. They know that an individual animal is designed by its breeder when its sire is selected. The breeder buys his bull having in mind the features of his herd that need strengthening and, since no one sire is likely to be perfect, he makes his selection forgiving deficiencies that he thinks his females can tolerate. When he has the opportunity he often buys an outstanding female, at great expense if need be, that will eventually convey a repeat dose of his herd sire through his herd and at the same time introduce some highly desirable qualities into his breeding raw material.

All breeders worthy of the name know the essential value and the limitations of the progeny test. They recognize the necessity for selection, dam-proving and the interaction of successive sires used within a herd as fundamental, and have been making contemporary comparisons for a very long time *within herds*. They have made an astute assessment of their herd sire's growth rate and development, and have a rough notion of its food efficiency. This is sire performance testing.

Experienced breeders are well aware that bulls should not resemble the steers they are expected to get. Bull calves are castrated, commercially, to make them what they are. Under the influence of a differently balanced hormone system, bulls develop differently in spirit, skeleton and fleshing. The breeder's eye penetrates through hair and flesh to the spirit and skeleton of the breeding animal. He looks for all the intangible and unmeasurable characters, worrying about quality, style, elegance, balance, beauty of form, character and vigour—all subjective and all capable of personal assessment. He is not unmindful of the need for economic qualities, but they are perhaps so fundamental to the subject that they call for no especial particularization.

There can be no doubt whatsoever that good, British cattle can be claimed as the handiwork of the master breeders, who have worked for the benefit of society and in pursuit of their art, largely along lines expressed in words and demonstrated by deeds nearly two hundred years ago by Robert Bakewell.

*Prospects of large-scale breeding*

Private breeders' work has been changed little by the impact of modern theories of genetics. Perhaps as a consequence of this, scientists are a little impatient in the field of cattle breeding. Some of them, however, plan with great knowledge and wisdom for the improvement of the nation's cattle, mostly through the agency of A.I. They are taking part in cattle breeding on a business basis, with scientific techniques and methods, and are carrying through a programme of breeding work that is bound ultimately to have vast effects on our cattle. They do so fairly, complementing the work of established breeders, collaborating with the breed societies and with individual breeders, each organization helping the others.

The scientists have started a process of breeding on a far larger scale than ever before, large enough to use methods based on population genetics and needing the perfection of tests and techniques with which the whole process is guided. Mistakes will be made; present methods of screening the sires and dams may be proved inadequate, and will no doubt be improved. No one supposes that present ways are perfect, but it is certain that a great deal of new knowledge will be accumulated for the future design of far-reaching and comprehensive breeding programmes.

One of the delightful prospects of this large-scale breeding programme in its early days was the opportunities it gave for very wide use indeed of an outstanding sire. In the past there have been some extraordinary animals, in many breeds, which could have made a much greater contribution than they did in the herds in which their work was confined. Of course it can be argued that in such herds they were working with highly screened material, and that there is still a place for the highly selective breeder mating the best to the best, narrowing the odds, and trying very hard to produce a pure fountain head of super select stock. This blood has been injected into the nation's cattle through a multi-tiered system of breeding in the past. It is a happy situation that the scientific groups who manage A.I. do not set out to discourage the most progressive breeders.

*Private breeders' craft should be preserved*

Yet the private breeders' market for bulls has shrunk and their opportunities for fame and wealth have rather fallen away in recent years. The isolated breeder is indeed a David pitting his strength and skill against Goliath, the electronic computer, fed by population geneticists with information collected in the great breeding organizations. One of these organizations has a staff of highly trained technical experts, who have the help and guidance of no less than 300 advisory cattle men, continuously passing objective opinions and suggestions about the bulls used, the progeny obtained and the methods used. Certainly the initiative seems to be passing to Goliath, but I hope that the Davids will not lose heart, for their craft and skill and wares are worth preserving. A few of them still breed wonderful cattle. They pit their intuition in selective mating, keen detailed sense of observation and knowledge of lines of cattle against the machine. We must encourage them to carry on doing so; we must see that the beef-breeders' keen eyes and

sensitive fingers retain their powers of detecting quality and character, and that the dairy-breeders continue *their* quest for quality.

The truth is that we are not quite sure that the scientists have really mastered the entire cattle-breeding business. Saying this is not to suppose that the equally respected individual breeders know all the answers either, or that they can invariably be relied on to find the right way, unaided by science. But before they are discouraged to extinction it would be well to play both the hands for a time, for perhaps they are necessary partners in the business! Yet progressive breeders themselves show signs of coming under the spell of the new science—or is it just a theory?—and in so doing could lose their “touch” and flair. Breeding cattle is full of disappointments, and voluble experts, who give the impression that old-fashioned ways are futile and scientific methods more certain, may well shake the confidence of some of the less intrepid.

If the subjective intangibles, like character and quality, are to be thrown away we shall have to tidy up considerably current objective measurements of virtues in cattle. There should be order in this substitution, and the current measures are patently inadequate. The old-style constructive breeders deserve no sneers or jibes, for they carry on under great difficulties, and the respect they command in the present atmosphere is slight indeed compared with cattle improvers in even the recent past. Their financial reward was never very great, I suspect, and it is less now, except for a small select company.

### *Importance of cow-families*

What is left for pedigree dairy cattle breeders to do as the machine takes over more and more of the major responsibilities for the breeding policy of the national dairy herd?

The national stud of bulls should surely be the sons of outstandingly successful bulls proven in A.I. service. Does this mean that the bull-pens on stud breeders' farms will be empty? Will the skilled breeder be guided by the A.I. ratings in the choice of nominated sires? But nomination is open to all; the expert breeder has no advantage in the use of sires. Perhaps he has an eye for a cow and has a herd of cows of surpassing beauty; his cow-families are the tools of his trade. Perhaps such families will be increasingly important in the new order. If the breeder can demonstrate the superiority of his females in their transmission, production and temperament then he has something really important. The advantage will lie with him so long as they function superbly, measurably and comprehensively. This is indeed a hard world for a master breeder to thrive in. Already the advantage is quite logically flowing to the big cow whose high yields are easily achieved within her physical and physiological capacity, so that she lives long, breeds well and retains her youthful beauty. Are the key breeders of the future then the owners of big cows? Do we seek cows as large as possible? Why? If size is so important, the leading breeders and the programme-makers for the national herd might start weighing cows and cut a tedious pilgrimage short. In some circumstances, big cows are not as desirable as medium-sized animals.

*Shall we get a standard cow?*

Another possibility is that the chief advantage nationally lies in achieving a highly uniform and good national dairy herd. A "standard" cow might be envisaged—and such an animal would have many advantages on real dairy farms. Milk producers would like to have a predictable, regular and standardized cow. The present national plans are perhaps designed to achieve this position. Uniformity within a herd has been an objective for a long time, but breeders have always valued superlatives even more than uniformity. The future is more likely to worship at the shrine of the high average uniform standard. Top breeders might usefully attempt to fix uniformity in the future for feeding into the national machine—and that would be an exercise to test their art for some time to come.

Artistic endeavour, then, is giving way to a scientific process. Old standards of excellence, and established faiths in pedigree lines and families of cattle and the men who breed them, are passing away. The breeding of cattle on a herd basis, involving many subjective assessments, is being superseded by a national breeding plan, based on the mechanized analysis of objective measurements. It is a most interesting situation. Clearly, each side has something to learn from the other, and already they recognize this and are constantly exchanging experiences and views. Human society benefits.

## The Flock on the Hill

IAN R. PUGH

*Director, Upper Towy Farms Ltd., Llandovery*

Even quite a small area enclosed on the hill will stop rams wandering, increase the number of ewes that conceive, reduce losses of lambs, and save much time in shepherding. And a handling pen near the steading will allow of much more discriminating drafting.

THIS Cardiganshire mountain farm rises to 1,400 feet, and carries a thousand breeding ewes on 1,500 acres, which vary from bare rock face to peat bogs and from green tops to bracken-infested slopes. Our tough little Welsh ewes, like so many thousand others in similar conditions, live the whole twelve months of every year on the hill. They do not have access to the improved pastures and turnips for wintering that better farms can provide. With only one per cent of the acreage as in-bye land, a problem very different from that of lower and better situated sheep farms presents itself: physical features such as rivers and mountain slopes are the only boundaries between one man's hill and another. The absence of cross fences allows hirsels of the same flock to mix. In brief, lack of control of the flock makes shepherding difficult at the best.

A lot has been said of the doubtful economics of this type of hill sheep

farm. The Mid-Wales Investigation Report (1955) was a depressing example. Obviously, a better financial return can be made elsewhere. The fact remains that great improvements can and should be made in the sheep stock and general management of these flocks—improvements that, once made, would leave behind them a worthwhile return for the time and money invested. A vast number of hill flockmasters spend little time, thought or money on their flocks, simply because even a poor return per ewe provides them and their families with enough for the standard of living that they have been brought up to accept as the hill man's "privilege". I will not dwell further on this point here, except to say boldly that ignorance through indifference is the primary cause of many of our present difficulties. I have noticed with admiration what a hill flockmaster can do when he aims at a higher standard of living.

Because our flock's potential has been rising since 1954 through seasonal dosing, away-wintering of ewe lambs, selective drafting and the introduction of new tups of good quality, I shall not draw comparisons with any preceding years—which would probably be unrewarding anyway. Instead I shall show briefly how this flock, suffering from a legacy of indifferent management and consequently giving a low return, has risen out of its lethargy in a few years to be an economic proposition. Before 1953, inbreeding had been practised consistently for years, and continues still in many flocks in the district.

Without means of control, there will always be some degree of inbreeding, for bought-in rams will wander when turned out to the mountain flock, benefiting, or perhaps damaging, anybody but the purchaser. However, a few enclosed acres surround almost every steading. Here an imported tup can be worked on a small bunch of ewes. Ram lambs procured in this way will live their life with the flock, and spread new blood through it. The safety valve of this method of improvement is that the quality of the in-bye-worked tup can be assessed by the simple expedient of marking his ewes and their lambs. If at any stage the lambs prove disappointing they can be culled.

### *Effects of tup-change and enclosure*

In the present unfenced state of our hill, an 80 per cent lamb crop must be considered reasonable, but seasons vary. One expects, and gets, good and poor lamb crops; but there should not be fluctuations ranging from 60 to 90 per cent of ewes mated, as has been suffered here. Neither weather conditions nor shepherding can be held accountable for them. The problem is one of barren ewes.

A small lamb-drop on this hill has in the past produced small and weak lambs. This can be attributed to hereditary factors arising from inbreeding, for as the percentage lamb-drop goes up, the lambs' quality also improves. The cause of barren ewes and resulting poor lamb crops has been not so much lack of fertility in the ewe as the failure of the tup, which has been aggravated by lack of vigour in seeking out the ewes. On this hill particularly a lot of searching for ewes has to be done. Such a lack of vigour appears to apply to ewes also; they do not seek the tup. Up to 25 per cent of the flock have failed to breed consistently; two consecutive years barren is common. Many drop their first lambs as six-tooths or full-mouths. Such infertility



# THE FLOCK ON THE HILL

has little to do with body condition. The ewes never conceive. Careful drafting in the past would have eased this complication, but the cure lies in other directions. After feeding of ewes began on one of the Hill Farming Research Organization's farms in Scotland, there were fewer barren ewes, but in Wales, the last six winters have been open ones, and abortion through lack of nutrition must be ruled out as a major problem here.

The following table is interesting, and shows clearly what the combination of tup-change and enclosure can do. This is a record of our experience in 1958-59 after enclosing 75 acres of the open mountain for controlled tupping and lambing.

*Table 1*  
*Difference in performance of bought rams in enclosure and home-bred rams on the open hill*

	No. of tups	No. of ewes	Barren ewes	Ewes losing lambs
Rams bought outside the district and used in enclosure	9	440	5	5
Rams home-bred (plus 4 local) and used on the open hill	16	540	61	29

Lamb losses on the open hill were much reduced everywhere last spring. The weather was generally kind, but if the spring had been hard, the poorer performance of the open hill group would have been more marked. The lambs from our home-bred tups were not so vigorous at birth, and more would have succumbed to bad weather and topographical hazards. Difficulty of keeping ewes in shelter—and more important out of dangerous places, where lambs, struggling to gain their feet, lose their lives in streams and crevices—is a bad weather problem, and anything up to 20 per cent of lamb deaths can be attributed to this kind of hazard alone. Fences reduce these casualties considerably.

*Table 2*  
*Barrenness and loss of lambs in ewes of various ages, in enclosure and on the open hill*

	2 yrs	3 yrs	4 yrs	5 yrs and over	Total flock	Per cent of total flock
	Barren ewes					
In enclosures	1	3	0	1	440	1.2
On the open hill	18	33	8	2	540	11.6
	Ewes losing lambs					
In enclosures	2	0	2	1	440	1.2
On the open hill	16	4	6	3	540	5.4

Ewes inside a fence can be shepherded without loss of time. On the open hill, by far the larger part of the day is spent looking for sheep that need help, which all too often comes too late. The younger sheep are those that need most assistance, and benefit most from control. Table 2 shows this, and the reward for the cost of fencing, significantly.

There is little need to explain further the advantages of control. Records kept of causes of lamb deaths showed that exposure and ewe neglect were



responsible for half the open hill losses. These causes did not contribute to the small loss suffered in the enclosures. During lambing we had necessarily to let the ewes with lambs back on to the open hill, to conserve the limited keep. More ewes were tupped and lambed in control by this practice of letting out than could otherwise have been accommodated.

Ewes put to purchased rams lambed slowly from 149 days. Open hill ewes lambed rapidly from 138 days. The suggestion here is one of contracted pregnancy due to factors arising from inbreeding. At four months old the lambs from imported blood weighed on average 8 lb heavier than lambs from our own home-bred stock rams.

### *Factors influencing size of hill lamb crop*

Five major factors having an influence on a hill lamb crop are weather, time of weaning, internal and external parasites, drafting, and ram control. The weather would be much less a determining factor with adequate control. Except in disastrous winters, one should not be at the mercy of the elements. Hard winters will cause loss through abortion, but any heavy loss from this cause would, I think, arise only after a scarcity of either summer or autumn grazing. Again, with fences, feeding on some scale can be done as necessity dictates. Even a small fencing programme on an open hill is a good investment. Without control, not one seasonal operation is going to be done properly.

Wether lambs are probably at their best in late July and August, and early selling avoids checks and losses in a wet season and is always advantageous to the hill, the ewe and the economics. Enclosures facilitate weaning, and the earlier the ewe lambs are taken away from the ewe, the better will be her recovery before the next tupping. Four-tooth ewes definitely need this extra time. And early weaning, where the lambs are away-wintered, also relieves the hill, and keep is preserved, reducing by a little the ewe's sparsest months.

Internal parasites are all too often the cause of heavy ewe, and subsequent lamb, losses in spring and autumn. Once pulled down in condition, a pregnant ewe must be a liability instead of a money-maker. Since drenching has been practised in this flock, ewe losses have been cut down to 3½ per cent. Drenching and away-wintering together have produced better shearlings that rear and care for their lambs; we notice a marked absence of desertion among shearlings now. External parasites take their toll in the many ways we all know. What is surprising is the number of flockmasters who refuse to drench or to dip an in-lamb ewe. There is no danger in putting a ewe through the dipping bath at any late stage of pregnancy. Dipping before lambing with one of the many efficient products on the market will reduce tick infestation in the lambs. I believe that dipping should be done as near to lambing as possible, and if the weather is difficult even after lambing has started, if this coincides with the tick rise.

### *Do not cull by age alone*

The inadequacy, and sometimes total lack, of sheep handling pens around steadings is well known. Sheep milling round in an open yard, or other ill-

designed working areas, suffer badly from bruises and internal injuries. Losses among sheep after each gathering are painfully obvious where such conditions exist, but these unnecessary losses are absent in flocks properly handled in specially designed yards. The manner in which drafting is done owing to this deficiency also results in an incalculable measure of loss. Draft ewes should not be culled by age alone, as in a great number of flocks. To let a full-mouth ewe return to the hill is often considered undesirable, but unless her teeth are weak or she is otherwise unsound, she can be a better proposition than a two- or three-year-old, and as such should be retained in preference to other sheep in a poorer physical condition. Usually two-thirds of the full-mouths in any hill flock are in adequate condition to lamb a further year, and at least half of these the year after again. Continually good results are made on hills that return an older-than-average ewe flock. Better, surely, to cull in the autumn younger ewes that are in too low a condition for further pregnancy and those which show other undesirable traits. Discriminate, rather than rule of thumb, methods of culling would eventually almost eliminate the worst niggers in the wood-pile! Ewes showing poorly in the spring should be marked as potential autumn draft. A lot can be said in favour of annual spring drafting of couples, and control at tupping allows for ewes so destined to be run with a tup suitable for the purpose of selling cross lambs.

### *Control of rams vital to good management*

The absence of control of rams can have catastrophic results. Bye-laws in many hill areas forbid the letting of tups on to open mountains before a certain date, but the prohibition is only arbitrary. Stray rams can almost always be found running riot amongst open hill ewe flocks. Ewes brought into enclosures are safe from the danger of an early hill lambing. Tups enclosed in a sound fence can be fed before working—money well spent—and their feet can be cured of all foot rot, which so often handicaps them on the hill. If hill rams were kept in bounds by all flockmasters, we could embark on breeding to a type—another advantage of the controlled tupping enclosures—instead of having the type dictated by a neighbour's tups, which may be anything but the desired breed.

All too few hill flocks contain good tups. Hill flock owners on the whole are loath to spend more than a few pounds on a ram, and one ram in a season or two is the usual purchase rate. One good ram is worth more to the flock than he is likely to cost, but one is seldom enough, for how can he compete with a score of villains. The changing of at least 15 per cent of stock rams annually is, after all, only good flock management.

### **"Agriculture" Index**

The Index to Volume LXVI will be issued with the April number.

# Consumer Preferences for Meat

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Although housewives are selective buyers of meat, many are surprisingly vague about the qualities they look for. Butchers and producers will not get a more precise idea of what the consumer wants until the public have been educated in meat buying.

It is clearly important to produce what the consumer wants, but seldom easy to define her choice. Market surveys are worth while to producers who can alter their products freely, and make other changes, in the light of the results: but fatstock cannot be radically or quickly changed to meet consumers' requirements, even when these are known. Furthermore, there are producers and butchers who take the view that "consumer preference is very much a question of retailer preference", and this too may help to explain why there have been so few studies of the ultimate consumer.

The ultimate consumer was approached in an inquiry at Leeds\* into the meat-buying habits of housewives in a working-class and a middle-class area of the city. Almost five hundred questionnaires, about half from each area, were completed by means of interviews, and some of the findings are given below. Regional differences in meat-buying habits may restrict some of the results of this investigation to the area in which it was conducted, but nevertheless I hope that the results will be of some general interest.

Beef and lamb face direct competition from imports, and the popularity of home-killed meat may be the first question in the minds of producers. Table 1 goes some way towards answering it.

Table 1

## *Purchases of home-killed and imported meat*

	Working class	Consumer group	
		Middle class	All housewives
		<i>per cent</i>	
<b>Beef</b>			
Only home-killed	61	76	69
Mainly home-killed	32	20	26
Only imported	1	—	1
Mainly imported	6	4	4
<b>Mutton and lamb</b>			
Only home-killed	29	23	26
Mainly home-killed	49	52	51
Only imported	3	2	2
Mainly imported	19	23	21
	Number of records		
	177	209	386

\* Meat Buying Habits. A. A. MARSH, University of Leeds, 1958.

# CONSUMER PREFERENCES FOR MEAT

Thus 69 per cent of all housewives said that they bought *only* home-killed beef, 26 per cent bought *only* home-killed mutton and lamb, but a further 51 per cent bought *mainly* home-killed mutton and lamb. These replies do not accord with the national supply position, but regional variations are known to occur. Furthermore, 25 per cent of working-class and 8 per cent of middle-class housewives do not contribute to this table for, by their own admission, they make no distinction between home-killed and imported meat. Only a minority of housewives regarded imported mutton and lamb (principally New Zealand) as better than home-killed, but half of them thought it as good.

Table 2

## Comparative quality of imported mutton and lamb

Served	Relative quality			No. of records
	Better than home-killed	Not as good as home-killed	The same as home-killed	
	Percentage of housewives			
Hot	18	32	50	297
Cold	14	41	45	275

Housewives were here assessing quality and no other attribute, such as the convenient small size of the joint from a 35 lb New Zealand carcass. The decline in the popularity of imported lamb when served cold was due to the characteristics of the fat: for this reason, some housewives never served the meat cold.

## Which meat do consumers prefer?

Housewives were asked if they, and the male head of the household, had a marked preference as consumers for any one class of meat. Percentages in Table 3 below do not total one hundred, for sometimes two meats were named, but preferences for more than two are recorded in the "no marked preference" column.

Table 3

## Marked preference expressed for particular meat

	Beef	Mutton	Lamb	Pork	No marked preference	No. of records
per cent						
Working class						
Housewives	36.2	2.9	25.9	17.6	23.4	243
Husbands	38.3	2.5	17.3	15.2	25.0	232
All consumers questioned	37.2	2.7	22.1	16.8	24.2	475
Middle class						
Housewives	42.4	0.4	21.2	13.4	25.5	231
Husbands	46.2	—	16.7	11.6	25.4	216
All consumers questioned	44.3	0.2	19.0	12.5	25.5	447

More men than women preferred beef, but more women than men preferred pork. The middle class had the stronger preference for beef and the

# CONSUMER PREFERENCES FOR MEAT

working class for pork. Preferences of this nature are not the only consideration determining actual meat purchases. Relative prices and the desire for variety in the diet are others, but if incomes continue to rise, so reducing the significance of price differences between various meats, and consumption levels approach American standards, such tastes may show the direction of change in demand.

## Choice of cuts

Consumers were asked which were their favourite joints, and it was stressed that answers here were to be given from the standpoint of the housewife buying for her household. The range of beef joints classed as favourites was wider among working-class than among middle-class housewives, but choice cuts from the hindquarter were the general favourite, rivalled only by brisket among the working class. Leg was the most popular joint of lamb, with shoulder as second favourite. Housewives showed a marked insistence upon small joints of mutton and lamb in particular, so that none need be eaten cold; and they preferred blade-end of shoulder and fillet of leg. For pork, loin cuts were most popular, with leg a good second favourite: shoulder enjoyed no great popularity.

The general picture in Table 4 is of a wider range of choice among working-class housewives, due to present preferences for the cheaper cuts.

Table 4

### Housewives' favourite choice of meat

	Working class per cent	Middle class per cent		Working class per cent	Middle class per cent		Working class per cent	Middle class per cent
Beef			Mutton and lamb			Pork		
Sirloin	21.8	47.6	Leg	55.6	69.7	Leg	26.0	21.2
Topside	20.1	35.1	Shoulder	33.3	28.0	Shoulder	4.7	4.8
Rump steak	6.9	11.9	Loin	1.7	7.4	Loin	15.2	33.9
Brisket	23.1	12.5	Loin chops	4.4	6.1	Fillet	20.8	21.2
Rib	3.4	7.4	Breast	3.1	2.2	Chops	4.3	9.6
Silverside	7.7	3.9	Neck	—	1.3	Belly	18.4	6.8
Forequarter flank	3.0	—	Other cuts*	3.6	1.7	Spare rib	3.8	2.9
Other cuts*	17.2	3.9	—	—	—	Other cuts*	11.9	5.3
No. of records								
	234	231		225	228		211	207

Percentages may total more than one hundred, for housewives were not restricted to a single choice.

\*Includes general replies such as "mince" "don't know".

## Consumer assessment of quality

When asked why they had named particular joints as favourites, housewives gave reasons which sometimes indicated their definition of quality. After economy in price and use, leanness was the most important characteristic. Next came absence of bone, something the producer cannot hope to provide, but which is acknowledged in the trade by boning out and rolling

rib and brisket of beef, for example. Tenderness and flavour were not of such general importance, but might be looked for in particular instances, such as the selection of sirloin, shoulder of lamb and loin cuts of pork. Usefulness as a cold joint and an acceptable and useful fat content were really significant only in the choice of brisket.

One-fifth of the working-class and one-third of the middle-class housewives relied considerably upon the butcher when buying meat, and most housewives shopped at one local shop. The characteristics they sought when choosing a joint of beef are analysed in Table 5.

Table 5  
*Characteristics sought when choosing beef*

	Working class	Middle class		Working class	Middle class
	per cent			per cent	
Colour			Marbling	8.0	5.5
Indefinite answer	51.7	33.0	Flesh not marbled	5.7	5.5
Good dark red	0.4	6.5	Fine grain	8.5	14.0
Good bright red	10.0	20.0	Little or no bone	10.4	10.5
Total replies	62.1	59.5	Fresh looking	8.1	12.5
Leanness			Firm appearance	4.3	4.5
Little or no fat	36.0	36.5	Succulence or juiciness	1.9	2.0
Some fat with the lean	28.0	27.5	Total no. of records	211	200
Colour of fat					
Indefinite answer	6.6	4.0			
Creamy	11.4	9.0			
White	6.6	7.0			
Yellow	1.9	3.0			
Total replies	26.5	23.0			

In general, the frequency with which various characteristics were chosen followed the same pattern among housewives of both social classes. Approximately 60 per cent of housewives wanted "good" colour, 36 per cent leanness, 25 per cent some fat with the lean, 25 per cent assessed the quality of the fat and 10 per cent looked for a joint with little bone. Replies were often indefinite or conflicting. For every housewife who looked for yellow fat as the "sign of a well fed beast" there were many more who said "as long as there is no fat, I take it". Marbling was mentioned by some housewives but not widely understood; "marbling is gristle, can't eat it". In so far as good colour was defined, a bright red was preferred. Some consumers did not like dark meat, and saw this as a disadvantage of meat hung before sale.

Producers may share with me a conviction that these observations bring them little nearer to a better definition of what the consumer wants. Some of the findings confirm, and should improve our understanding of, the difficulties of the meat trade, which sells to housewives with a narrow range of preferences and an insistence upon small joints. Housewives are not well informed on meat, but their participation in the Leeds study shows their interest in the subject. There were housewives who had a favourite joint but were unable to name it, and one bought a joint "shaped like a shoe box with



a bit of fat at one end"! If consumer preferences continue to be presented in this way, then further studies of meat-buying habits will prove equally unsatisfactory to producers.

Butchers and producers will only get a better idea of what the consumer wants when the buying public are well informed. (The retail trade already takes a great deal upon itself; it is apparently in a position to determine retail prices which do not reflect wholesale prices determined for producers by the seasonality of supplies, and it does not need to bolster its position by selling to ill-informed customers.) Producers can justifiably criticize the ill-defined objective put before them at present, and should encourage their own associations and the meat trade to educate housewives in meat buying. Pre-packaging of meat will develop rapidly as technical advance removes the present difficulties, but the producer need not wait for that before considering consumer requirements closely. If, from now onwards, he looks beyond the demands of the wholesale market and the retailer for his definition of consumer choice, meanwhile helping consumers to choose more soundly, he will be in a better position to benefit from the new development when it comes.

## Silage-making on the Smaller Farm

G. H. BRAYSHAW, M.A.

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Mr. Brayshaw compares the cost of, and time taken by, several systems of making silage, employing one, two or three men with a forage harvester or a buck-rake.

SILAGE-MAKING comes at one of the busiest times of the year, and farmers want it done quickly and efficiently. Yet in a recent investigation on small dairy farms in the north, the rates at which silage was made were found to vary from 0.4 to 2.3 tons per man-hour, and to average well under a ton per man-hour.

Although differences in the distance between field and clamp did, of course, influence individual performance, by far the greater part of the variation could be attributed to differences in the equipment and systems used. It was possible to calculate suitable standards of performance for a number of different methods. Some of these are summarized as methods 1-6 in Table 1 and selected examples are given in more detail in Table 3.

The forage harvester used is presumed to be a small one with a 40-inch cut. It is assumed that a tractor of adequate power is pulling the harvester, that top performance is sought from it, and that 25-cwt loads are taken to the clamp in well designed, rear tipping trailers.

One man equipped with a tractor and two tipping trailers, with a second man buck-raking tipped silage on to the clamp, can keep a third man operating a small forage harvester fully occupied if the silage has not to be

carted more than about 300 yards (method 5). Up to this distance, the speed of cutting and loading will probably limit output and, if 6.6 tons of silage an hour are to be made, most of the hitching and unhitching must be done by the trailer driver. With a greater distance than 300 yards between the field and the clamp, output is limited by the transport available, and if the forage harvester is to be fully utilized a man with an extra tractor and trailer must be added to the team. If this is not possible, the balance of the original team is likely to be at its best if the harvester and trailer driver share the work of hitching and unhitching when the clamp is 400-600 yards away, and if the harvester driver does most of it when the clamp is more than 700 yards away.

If rolling is carried out before and after a period of cutting and carting, and if it is more important to obtain a high output per man than per day, almost the same output per man-hour might be obtained using one less tractor (method 3). With only two tractors, however, the full trailer must be emptied on top of the clamp, and arrangements should be made for winching the tractor and an empty trailer off the clamp if they get stuck.

With each of these systems it is possible to obtain a high output per man-hour and per day, but each requires too much equipment to be very much use on the smaller farm unless neighbouring farmers are prepared to co-operate.

### *Methods needing less equipment*

Of the methods requiring less equipment, one man equipped with a small forage harvester and a suitable 25-cwt rear tipping trailer can make about two tons of silage an hour, if the clamp is not more than 300-400 yards away (method 4). This compares very favourably with the performance to be expected from two men, although of course fewer tons of silage will be made each hour.

Perhaps it is more important to appreciate that the smaller forage harvester may offer advantages only if silage has to be carried more than a few hundred yards to the clamp, or where a large amount of silage is to be made and the amount per hour is therefore as important as productivity per man-hour, or where labour capable of really skilled buck-raking is not available.

From Table 1 it will be noted that if the silage clamp is less than some 300 yards away, a skilled worker with a tractor and rear mounted buck-rake (method 6) can make two or more tons of silage an hour, and as much as or more than if he were equipped with a small forage harvester. As transport distances increase, and because he carries a smaller load, his output falls off faster than that of the man using a harvester and one trailer—although he can still hope to make 1.7 tons of silage an hour when the clamp is 400 yards away.

There are many farms on which silage does not usually have to be carted more than 300 yards. On the dairy farms of between 50 and 150 acres from which data were collected, the average distance to the clamp was 390 yards. It was buck-raked an average distance of 290 yards and carted 430. Apart from the additional depreciation on a forage harvester, on a large number of these farms skilled buck-raking needs no more labour than a harvester and only one trailer. On others the labour saved by using a harvester would not be very great.

# SILAGE-MAKING ON THE SMALLER FARM

Table 1

Output of silage from various methods of cutting, carrying and ensiling

METHOD	Distance to clamp (yards) Output (tons)									
	100		200		400		600		800	
	per man- hr	per hr	per man- hr	per hr	per man- hr	per hr	per man- hr	per hr	per man- hr	per hr
1. One man cutting and loading; one carting to clamp and spreading. Rolling done before and after spreading. (2 men, 2 tractors, 2 trailers, 1 forage harvester)	2.1	4.0	1.9	3.7	1.6	3.2	1.4	2.8	1.3	2.5
2. One man cutting, loading and carting; one spreading and rolling. (2 men, 2 tractors, 1 trailer, 1 harvester)	1.8	3.6	1.6	3.3	1.4	2.9	1.3	2.5	1.1	2.3
3. One man cutting and loading; one transporting to clamp, one spreading. Rolling done before and after cutting. (3 men, 2 tractors, 2 trailers, 1 harvester)	1.9	5.4	1.9	5.4	1.9	5.4	1.6	4.5	1.3	3.7
4. One man cutting, loading, carting and spreading. Rolling done before and after cutting. (1 man, 1 tractor, 1 trailer, 1 harvester)	2.2	2.2	2.1	2.1	1.9	1.9	1.8	1.8	1.6	1.6
5. One man cutting and loading; one taking to clamp; one buck-raking tipped silage on to clamp and spreading. (3 men, 3 tractors, 2 trailers, 1 buck-rake and 1 harvester)	2.2	6.6	2.2	6.6	2.0	6.1	1.7	5.1	1.5	4.4
6. One man with a tractor and rear mounted buck-rake.	2.8	2.8	2.3	2.3	1.7	1.7	1.4	1.4	1.1	1.1

If, in addition, the extra depreciation on a harvester is considered, and it is accepted that the implement should be written off in five years, then even when the distance to the clamp averages 800 yards, a man with a small harvester and a single tipping trailer would have to ensile about 60 acres of grass each year before the cost per ton was less than when made with a buck-rake.

# SILAGE-MAKING ON THE SMALLER FARM

Table 2

*Estimated costs assuming an 8-ton crop and 800 yards between field and clamp*

## FORAGE HARVESTER AND ONE TIPPING TRAILER

<i>Fixed costs</i>	£	£
Depreciation at 20 per cent over 5 years	50	
Interest of 5 per cent on average investment	6	
	—	56
<i>Variable costs per 100 acres</i>		
Repairs	13	
Labour, 500 hours at 4s.	100	
Tractor fuel and repairs, 500 hours at 3s. 6d.	88	
	—	201
<i>Total cost per 100 acres</i>		257

## BUCK-RAKING

<i>Fixed costs</i>		
Interest at 5 per cent and depreciation at 20 per cent over 5 years		9
<i>Variable costs per 100 acres</i>		
Repairs	4	
Labour, 727 hours at 4s.	145	
Tractor fuel and repairs, 727 hours at 3s. 6d.	127	
	—	276
<i>Total cost per 100 acres</i>		285
Difference in costs per 100 acres	28	
" " variable costs per 100 acres	75	
Difference in variable costs required to equalize the costs of the two methods	47	

$$\text{Silage required for equal costs} = 100 \times \frac{47}{75} = 63 \text{ acres}$$

In this estimate it is assumed that a tipping trailer does not have to be specially bought for silage-making, and that a tractor of sufficient power to pull a harvester is used for both forage harvesting and buck-raking. Although this may rarely be the case, a tipping trailer would be useful for many other jobs and should not be charged solely to the silage, and in any case the intention of these assumptions is to make a comparison under the circumstances most favourable to the forage harvester. Under less favourable circumstances, with smaller acreages or a smaller distance between the field and clamp, buck-raking should be the cheaper of the two methods.

For these reasons, the small forage harvester should not be looked on primarily as a means of reducing silage-making costs, on either small or medium-sized farms, where only one or perhaps two trailers are available, but rather as an aid to making more silage in the time available. Only when the average distance between field and clamp is considerable, and when enough trailers are available to keep it fully employed, is a forage harvester more likely to reduce the cost of silage-making than skilled buck-raking.

The performances given are those that we believe can reasonably be expected from skilled workers, properly equipped. Admittedly more skill is

# SILAGE-MAKING ON THE SMALLER FARM

Table 3

*Selected methods in detail, showing the basis of calculation*

## METHOD 1

One man cutting and loading;  
One carting to clamp and spreading.  
Rolling done before and after cutting.  
2 men, 2 tractors, 2 trailers, 1 harvester.

### 1st man: harvester driver

	min
Cutting and loading 25 cwt	9.5
Unhitching full trailer	1.0
Disconnecting and unhitching empty trailer	0.9
Hitching and connecting full trailer	1.3
Hitching empty trailer	1.0

13.7

### 2nd man: trailer driver

Clamp distance (yards)	100	200	400	600	800
			minutes		
Waiting for No. 1 to unhitch	0.9	0.9	0.9	0.9	0.9
Backing and waiting for No. 1 to hitch	1.3	1.3	1.3	1.3	1.3
To silo	0.9	1.8	3.6	5.3	7.1
On to clamp, tip load and off clamp	1.5	1.5	1.5	1.5	1.5
Spreading	10.2	10.2	10.2	10.2	10.2
To field	0.6	1.2	2.5	3.7	5.0
Work cycle	15.4	16.9	20.0	22.9	26.0
Man-minutes per load	30.8	33.8	40.0	45.8	52.0
Rolling per load	1.3	1.3	1.3	1.3	1.3
10 per cent minor breakdowns and relaxation allowance	3.6	3.9	4.6	5.2	5.9
Total per load	35.7	39.0	45.9	52.3	59.2
Tons per man-hour	2.1	1.9	1.6	1.4	1.3

Note that the trailer driver is the lead operator, and that the harvester driver becomes progressively under-employed as the distance between field and clamp is increased.

## METHOD 4

One man cutting, loading, carting and spreading.  
Rolling done before and after cutting.  
1 man, 1 tractor, 1 trailer, 1 harvester.

Clamp distance (yards)	100	200	400	600	800
			minutes		
Cutting and loading 25 cwt	9.5	9.5	9.5	9.5	9.5
Unhitching and hitching	3.1	3.1	3.1	3.1	3.1
To silo	0.9	1.8	3.6	5.3	7.1
On to clamp, tip load and off clamp	1.5	1.5	1.5	1.5	1.5
Spreading	10.2	10.2	10.2	10.2	10.2
To field	0.6	1.2	2.5	3.7	5.0
Unhitching and hitching	3.3	3.3	3.3	3.3	3.3
Work cycle	29.1	30.6	33.7	36.6	39.7
Rolling per load	1.3	1.3	1.3	1.3	1.3
10 per cent minor breakdowns and relaxation allowance	3.4	3.6	3.9	4.2	4.6
Total per load	33.8	35.5	38.9	42.1	45.6
Tons per man-hour	2.2	2.1	1.9	1.8	1.6



# SILAGE-MAKING ON THE SMALLER FARM

## METHOD 6

One man with a tractor and rear mounted buck-rake.

Clamp distance (yards)	100	200	400	600	800
			minutes		
To field	0.5	1.1	2.1	3.2	4.2
Turning, backing to swathe and lowering rake	0.2	0.2	0.2	0.2	0.2
Picking up 6-7 cwt grass	1.3	1.3	1.3	1.3	1.3
To silo	0.8	1.7	3.4	5.0	6.7
On to clamp, drop load and off clamp	0.4	0.4	0.4	0.4	0.4
Spreading	1.1	1.1	1.1	1.1	1.1
Work cycle	4.3	5.8	8.5	11.2	13.9
Mowing	1.8	1.8	1.8	1.8	1.8
Rolling per load	0.4	0.4	0.4	0.4	0.4
10 per cent minor breakdowns and relaxation allowance	0.7	0.9	1.2	1.5	1.8
Total per load (6-7 cwt)	7.2	8.9	11.9	14.9	17.9
Tons per man-hour	2.8	2.3	1.7	1.4	1.1

required to use a buck-rake than a forage harvester efficiently and an unskilled operator will require considerable practice before he can be expected to achieve these performances. There may be cases where a harvester is justified because labour capable of skilled buck-raking just isn't available.

The choice between methods should not be based solely on labour requirements, nor on the cost of making silage. Lacerated silage occupies less space. It can be put into a smaller clamp, which will be less expensive to cover. Having been cut and immediately clamped, it may also be of lower quality in certain areas and seasons. For these and similar reasons the scale of operation required to justify the purchase of a forage harvester must be adjusted in any particular case.

## ★ NEXT MONTH ★

*Some articles of outstanding interest*

FARMING IN THE FIFTIES by *W. B. Mercer*

CONTROL OF GREENING IN UNDRAWN POULTRY by *D. H. Shrimpton*

APPROACH TO HAY AND SILAGE by *Martin Jones*

CAPITAL INVESTMENT IN HORTICULTURE by *L. G. Bennett*

# The Irrigation of Potatoes

E. J. WINTER, M.C., M.S.C.

*National Vegetable Research Station, Wellesbourne*

The most profitable time to irrigate potatoes is just after the tubers have begun to form. Without using a prodigal amount of water, irrigation then can increase yields by 30 per cent or more, according to the weather.

LAST year's prolonged drought has emphasized the precarious nature of our water supply, but even in a year of average rainfall, there is hardly enough water for all purposes. The ever-increasing demand by industry and domestic users means that only a comparatively small amount can be spared for irrigation. Farming could profitably use far more water for irrigation than is ever likely to be available; therefore it is desirable to irrigate only those crops which give the greatest increase in yield per gallon of water expended, and furthermore to irrigate only when the plants are sensitive to moisture. Not all plants have yet been shown to have stages of growth at which they are specially sensitive to water shortage, but fortunately for the potato grower this plant does give substantial yield increases following irrigation, and apparently does respond more favourably to irrigation at some stages of growth than at others.

Only a comparatively few experiments on the irrigation of potatoes have been carried out in this country. In one experiment with early potatoes, the Efford Experimental Horticulture Station staff in collaboration with the National Vegetable Research Station<sup>1</sup> applied a treatment in which the soil moisture deficit was never allowed to become more than  $\frac{1}{2}$  inch. This had no effect in 1958 (a wet year), but increased the ware crop by 54 per cent in 1959 for the expenditure of five inches of irrigation water. However, applying only 1.8 inches in two applications after the small potatoes had begun to form (also in 1959) gave a 30 per cent increase in yield. This was obviously a better way to use any water available.

Other experimenters in this country have obtained larger yield increases with both early and maincrop potatoes. For example, in 1951, 1952 and 1953, Penman<sup>2</sup> obtained an average increase of 53 per cent by irrigating early potatoes at Woburn, while in 1959 he obtained 80 per cent increase with maincrop potatoes. In 1954 and 1956, both wet seasons, there was no advantage from irrigation. In 1955, Ivins and Montague<sup>3</sup> at Sutton Bonington, and the Experimental Husbandry Farm staff at Gleadthorpe, each obtained maincrop yield increases from irrigation of the order of 100 per cent.

Thus in five of the nine years 1951-59, ware yield increases between 50 and 100 per cent were obtained as a result of irrigation in different parts of the country.

## *When to water*

All these workers irrigated throughout most of the life of the crop, and thus obtained maximum yields. However, in view of the need for conserving

## THE IRRIGATION OF POTATOES

water, it would seem better for the farmer to use a treatment based on the Efford results quoted, and be content with a smaller total yield increase by irrigation only once or twice during a moisture-sensitive stage of growth.

Investigation of such stages of growth in potatoes has not yet been completed. There is evidence that, as with most other plants, copious watering of potatoes during the early stages of growth results in the production of large amounts of foliage, not necessarily followed by a proportionate increase in the yield of saleable produce. Watering potatoes after the tubers have begun to form, however, does increase the crop. With many varieties which flower during the normal growing season, blossoming coincides with the beginning of tuber formation; with these varieties, the onset of flowering can be taken as the time to start irrigating.

In a year of normal rainfall, it may be assumed that there is sufficient water in the soil to carry the crop up to the time when the flowers open or the tubers are about the size of peas, and watering need not begin until this time. On the other hand, in a dry season it may be necessary to irrigate before this stage, and the results of experiments overseas as well as in this country suggest that at no time during the life of the crop should the soil be allowed to lose more than half the available water in the root zone. We may take the average rooting depth of the potato crop to be about one foot. Half the available water in this depth of soil is equivalent to about half an inch of irrigation on a light soil, and one inch on a heavy soil. However, in a dry season, irrigation before tuber formation must be considered in relation to the requirements of other crops on the farm. Under dry conditions the potato yield will be increased by irrigating at any stage during growth, but if insufficient water is available to deal with all the crops which need it, then potato irrigation should not be begun until after the tubers have started to form.

The time to begin watering potatoes also depends upon whether early or maincrop varieties are being grown. Early potatoes, being the more valuable, may justifiably be watered earlier in their growth than maincrops, and may have a higher claim on the water available for irrigation than other crops on the farm. There is little doubt that in a dry spring, early potatoes will pay handsomely for irrigation begun as soon as all the shoots have fully emerged from the soil.

### *How much do potatoes require?*

In dry summer conditions in this country, the potato crop is likely to use water from the soil at the rate of about an inch every ten to fifteen days, though it must be appreciated that the actual amount lost may vary from this, depending mainly upon weather conditions. Thus if the plants are not to use more than half the available water in the top foot of soil during hot dry weather, half an inch of water must be applied every five to seven days on a very sandy soil or an inch every ten to fifteen days on a heavy soil. Most irrigators will agree that it is hardly worth setting up the equipment to apply only half an inch of water, and so on a light soil the practical man would accept a compromise between the theoretically desirable treatment and that which is economically sound.

As far as our knowledge goes at present, for average soil conditions the

best practical irrigation treatment after tuber formation or blossoming would be to apply about an inch of water every fortnight in dry weather. In showery weather the amount should be proportionately less. With lighter soils, more frequent irrigations should be aimed at. These recommendations are tentative and may need to be modified in the light of results of further research.

The actual quantity of water to be applied at each irrigation should be related to the current soil moisture deficit, to avoid the danger of applying more water than the soil can absorb, with the consequent ill-effects of water-logging and through drainage, and also to conserve the available supply by using no more than is really necessary.

There are several methods of assessing soil moisture deficit which are suitable for use by growers. One of these is described in Ministry of Agriculture Technical Bulletin No. 4, *Calculation of Irrigation Need*. A simplification of this system has been developed by J. North of the N.A.A.S. Both methods require the grower to maintain a rain gauge and keep records of rainfall and any irrigation applied. Alternatively, an instrument is on the market which furnishes a continuous indication of the soil moisture deficit, and obviates the need for a separate rain gauge and the keeping of records.

## Fewer chats produced

In addition to its influence on gross yield, irrigation can have other effects on the potato crop. For example, it has been shown in America that although the number of tubers per plant was unaffected by irrigation, the number attaining ware size was increased. Thus irrigation may be expected to reduce the proportion of chats in the harvested crop, and so increase its market value.

Irrigation by sprinkling is unlikely to affect the incidence of blight unless the fungus is already active in the crop.

With early potatoes, overhead irrigation has helped to reduce the damage by frost occurring at any time during the next four days after watering. This procedure is different from the accepted method of preventing frost damage to fruit blossoms, which is to induce the formation of a protective layer of ice over the flowers. For the potato, the presence of a comparatively large area of wet soil around the young shoots can prevent the local air temperature from falling dangerously low, and so protect the shoots.

The potato crop is one of those whose yield may undoubtedly be substantially increased by irrigation, except in wet years. It will be necessary, however, to carry out much more research to find the best irrigation procedure, and the best possible way to use whatever water is available. Results so far indicate that irrigation throughout the life of the crop causes the biggest increase in yield, but where water supplies are limited, the best return for the water expended is obtained by delaying irrigation until just after the tubers have been formed.

## References

1. *Rep. nat. Veg. Res. Sta., Wellesbourne for 1959* (in press).
2. *Rep. Rothamst. exp. Sta. for 1951-57*.
3. *Agronomic Factors affecting Yield of Potatoes*. J. D. IVINS and V. J. MONTAGUE. *Rep. Univ. Nottingham Sch. Agric., 1955*.

# Partridges: A Policy for Rearing

CHARLES COLES

*I.C.I. Game Research Station, Fordingbridge, Hants*

Every season contributes something to game farm management. Mr. Coles discusses new developments. We are indebted to him, and to the Editor of *The Field*, for permission to reprint this article.

LET us start with the egg. With six years of reasonably large-scale egg production behind us, supported by laying records from a few game farms and about thirty private estates in this country and one in France, it is becoming increasingly clear that it is probably not economic to pen only a few pairs. Unless the breeder has plenty of spare time, or is content to regard partridge breeding in the same light as orchid growing, I doubt whether it is worth penning fewer than forty pairs. Some hens which appear to be happily mated will lay no eggs at all. Of those that do lay, one pair may lay seventy eggs and the next-door pair only ten eggs. The average of all pairs penned will probably be between twenty and twenty-five eggs up to the end of June.

As the seasons go by we shall learn to improve our management methods, and find out what causes irregular laying and apparent barrenness—traits which are happily not found in the uncomplicated pheasant. However, for those who insist on keeping a dozen or so pairs and accept the whims and vagaries of the unpredictable partridge, I would make these brief suggestions. Keep the birds as tame as possible. Be prepared to mate-up the pairs from mid-February onwards, according to the mildness of the weather. Watch out for fighting in the pens in the autumn and again early in the year, when the wild cock partridges come round to plight their troth. And be stony-hearted with these intruders, for they will not merely unsettle the hens and cause subsequent divorces, but they are also likely to cause injuries and death.

Having by now probably dissuaded the waverers from keeping small units of breeding pairs, the next question is obviously where to get some eggs. Unfortunately, this invariably answers itself, for every sizeable partridge estate will almost certainly have a number of clutches cut out by the mower, or otherwise deserted as a result of agricultural operations, predation and so on. Unless an efficient rescue service is planned, a number of "bald patches" will be apparent when the birds are counted in August. It is essential that some broody bantams are enthroned on dummy eggs in readiness for salvage operations before the first swath of hay is cut. On our experimental estate we have cut out as many as seven hundred eggs in one season.

To increase the partridge stock—as opposed to merely protecting what is there—it is a sound policy to find a convenient number of early nests and remove the clutches at, say, the twelve-egg stage, or any rate before the bird goes down. The nest itself should be completely destroyed, so that the bird will lay a second clutch elsewhere. In nine cases out of ten the birds that have re-nested will be found with a second brood no smaller than the average for the year—unless they have had the misfortune to nest in the grass. And by inducing these birds to make later nests, the hatching peak will have been



spread over a longer period. The first broods, which will have been hand-reared, will almost certainly be larger than the average wild brood, although there will probably be a further wastage after the young birds have been released.

We still have a great deal more to learn about the technique of planting out reared partridges, but such evidence as we have suggests that the same percentage of reared birds is shot in the first season as is harvested from the young, wild stock. Depending on circumstances, it may be a better policy to release the reared birds after shooting. Either way, partridge rearing is a sound investment, particularly after a series of bad breeding seasons when the stock will be composed of a disproportionate number of old birds.

There are two ways of rearing partridges which have proved themselves over the last few years. The first entails the use of low movable pens with bantam foster-mothers, sun-parlours and dusting trays. The two latter items, incidentally, are not frills but very necessary parts of the pen which will be valuable in cold wet seasons. The second method consists of brooder rearing. Partridges respond well to the semi-intensive system, and seem to become conditioned to such things as the source of heat, the entrance to the brooder and the external rain shelter more quickly than pheasants. The type of brooder we have used successfully consists of an infra-red, dull-emitter electric heater housed in a small wooden hut enclosing 5 ft by 5 ft of grass. Sliding doors connect with a grass run on either side of the hut, each run being used in turn. Under these conditions partridges usually like to have heat for five weeks, whereas in a normal season pheasants can do without it in three weeks, being transferred at that age to a separate holding pen containing only an unheated night shelter.

The key to successful rearing consists mainly of correct feeding, but now that digestible, balanced crumbs are available for partridges, those difficulties have largely been overcome. For the first few days sieved egg-yolk can be added to the crumbs, and within a short time the chicks will be feeding from troughs or hoppers. While it is essential to fuss over partridges a good deal more than pheasants, there is no need to hand-feed four times a day or to make a few pens the excuse for neglecting work on the beat. The wild birds depend on old-fashioned hedgerow keeping and nothing will replace it—not even a row of neat pens full of sleek, plump, young partridges for the boss to admire.

Disease can be a stumbling block which can humble the proudest of us, just when we are counting heads and patting ourselves on the back. For example, partridges do not always seem to respond to the coccidiosis drugs as well as pheasants, nor do they exhibit the usual symptoms warning us of gapes. However, clean rearing ground and prompt *post mortem* examinations of any casualties are the best insurance against such losses.

At any time after eight weeks the pen-reared birds will be ready to go out on to the shoot with their bantams, but the brooder-reared partridges will first have to be divided into groups of fifteen before they can be released from small pens. Half the "brood" should be released first and the remainder two days later—the pen being left out on the ground as long as the birds come back to it for feeding.

A booklet describing partridge rearing in detail is available without charge from the I.C.I. Game Research Station.



# Harvesting and Marketing Onions

E. A. WILLIAMS

*Ministry of Agriculture, Fisheries and Food*

The methods of harvesting, storing and marketing home-grown onions vary greatly, and can lead to poor keeping quality. Attention to details of harvesting and storing, and then grading to defined standards, will pave the way for more efficient marketing and satisfy discerning buyers.

ONIONS have been cultivated for food from the earliest period of history, and are now grown in many lands under varying conditions of climate and soil. In this country they are grown mainly in Lincolnshire (Holland), the Isle of Ely, Cambridgeshire, Norfolk and Bedfordshire. On some holdings twenty acres or more are put down to onions, but in most areas smaller units predominate, and many are grown on between one and two acres. The total acreage increased considerably during the last war, but since 1949 has shown a steady decline. Even so, it is still well above the pre-war level. The crop is not one of the most important, but it has an appeal and growers include it in the rotation for a number of reasons. For example, in the Isle of Ely onions are inter-cropped with strawberries, and in other areas they are grown because they provide work for the staff during the off seasons. And when bad weather prevents work in the open, grading and dressing can be carried out under cover. Under good husbandry and favourable weather conditions onions can pay.

The crop is generally raised from seed, but some growers produce good bulbs from sets. Shape varies considerably, from elongated to flat, the most popular being the medium round (globe) and flat. Among varieties most frequently seen during recent field studies were Bedfordshire Champion, Rijnsberger, Ailsa Craig, Giant Zittau, Best of All, Up to Date, Ebenezer, Nuneham Park and A.1.

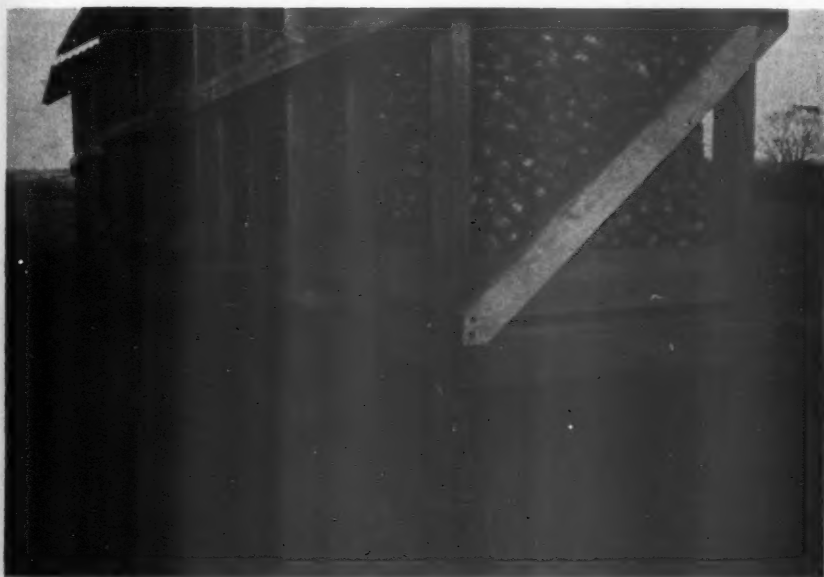
## *Harvesting*

Harvesting methods show some variation from area to area and even in each area, probably because of differences in the size of units under production, general farm methods, mechanical equipment in use and the labour available.

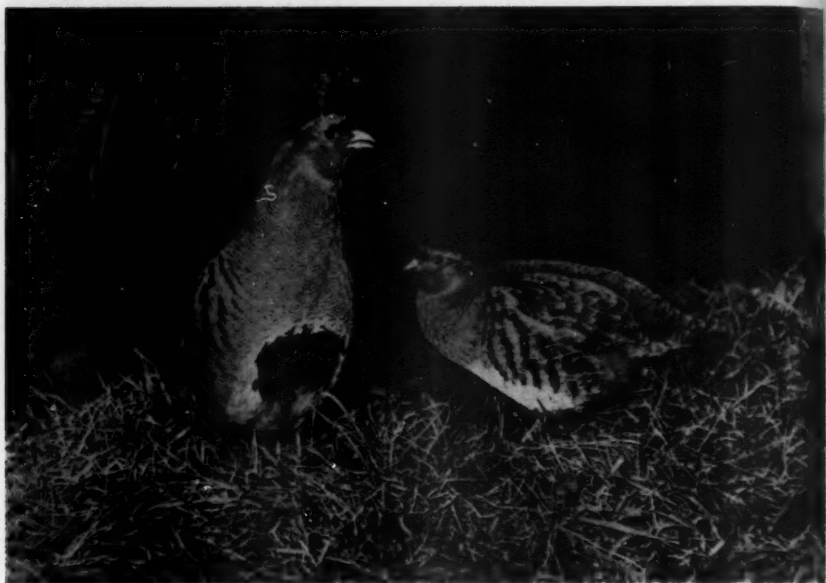
The bulbs should be lifted when they have grown to full size, when the green tops begin to topple over, and before second growth starts. Lifting may be done by hand or mechanical means, and should always be carried out during dry periods. The bulbs should be laid on a weed-free surface; this is most important, because they will not ripen properly unless exposed to the air and kept free from dampness. When the land is wet, the onions should be lifted off the soil and put into slatted trays. It is usual to windrow onions at the time of lifting; during the preliminary ripening on the ground the bulbs should be turned from time to time with wooden hand-rakes to help dry them out.



Good bulbs, well graded and packed like these, will always attract buyers quickly.



These permanent storage pens are built off the ground for all-round ventilation.  
The projecting boards pull out for unloading.



This pair may lay up to seventy eggs, or none at all. Because partridges are so unpredictable, it probably does not pay to pen less than forty pairs.



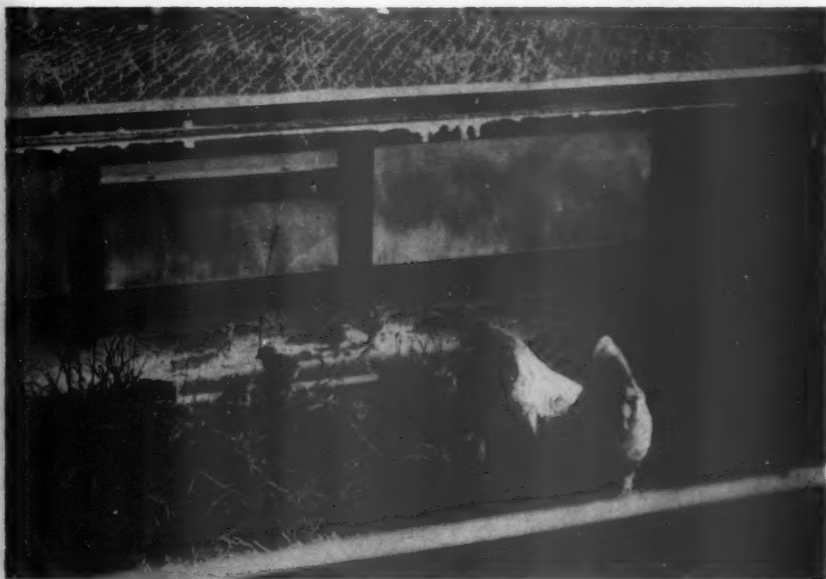
Photo: Ben Darby

Many clutches in the field will be deserted for one reason or another. The eggs should be put under broody bantams.



Photo: John Tarlton

Three-week-old chicks reared under infra-red heat, with a grass run outside the brooder house.



Sun parlours and dusting trays are not luxuries but very necessary parts of the rearing pen, which will be invaluable in cold, wet seasons.



Photo: Boots Pure Drug Co. Ltd.

Three late-lactation Dairy Shorthorn cows at Thurgarton have adopted ten calves a few days old. It has not been difficult to mother orphan calves.

### *Storage*

When the onions intended for store are reasonably dry, they may be carted in for cleaning, or cleaned in the field. To ensure keeping quality, only sound bulbs should be stored, any showing disease, decay, thick-neck, mechanical damage or other defects which impair quality being discarded. Some growers remove the luffs (tops) and roots, but others prefer to leave these intact so that aeration is assisted during the storage life, and remove them at the time of marketing. They should be twisted off and not cut, as a knife can damage the bulb, causing subsequent leakage. Onions left on the field in bags or slatted trays for storage later should be inspected frequently for keeping quality. Bagged onions should be turned from time to time, as this moves the contents and prevents dampness.

For successful storage, dry, well ventilated accommodation is needed and the bulbs must be properly harvested and of good keeping quality. Onions should be stored where there is plenty of air circulation, and any well ventilated building is suitable, provided it is dry and the following precautions are taken. They should be kept off the ground and not stacked in heaps (particularly when placed in bags), and the storage arrangements should let ample air circulate freely round the bulbs. Easy access should be allowed for inspection. This is most important, because rot is progressive and quickly spreads, resulting in serious loss during storage. In Bedfordshire some of the lofts built of timber, with slatted walls, were specially made for onion storage many years ago, and are still in use. The onions are shot out on to slatted racks which have a space of one inch between them so that air circulates around the bulbs; the layers of onions are kept shallow to avoid over-heating and facilitate inspection.

Onions may also be stored successfully under cover when they are put in suitable containers, such as slatted potato-chitting trays or lettuce crates. Where ample storage space is available, additional ventilation is provided if the lettuce crates are stacked "pigeon-hole fashion", the stack thus forming a pyramid shape with spaces between the boxes in each layer. Often an open site can be found where the wind will blow through the stacks or pens. Slatted potato-chitting trays may be used, but they should not be stacked too high, and each stack should be covered, to protect the contents during bad weather. The onions should also be raised off the ground.

Pens made of one-inch-gauge wire netting, with iron or stout wooden posts for supports, are also used successfully for storage in the open. They may be V-shaped, when the supporting posts are driven in the ground at an angle of 45 degrees, or erected as straight runs with sloping roofs. Here again the onions should be raised above the ground and the pens covered.

### *Grading and dressing*

Onions should be clean, dry and sound, with the outer scales crackling as they are moved or handled. Some growers prefer to riddle their crop in the open, choosing a fine day with fresh winds; they like to hear the onions rustle as they are being dressed. Others like to keep this operation for a rainy day, when the work is carried out under cover. When the crop is hand-riddled, the equipment required includes riddling stands, mesh sieves, wicker or



metal skips, and funnels for filling the bags that are to be marketed. Modified potato sorters, adjusted for the appropriate sizing of the bulbs, may also be used for riddling and dressing; some growers use the revolving carrot-washing machine with an elevator attachment for quality sorting and sizing. Onions are usually dressed as they are required for market. Any stored after this will need frequent inspection.

### Marketing

Often onions sent to market as "dry" are found to contain green bulbs which will not keep. Once a buyer has seen them, his confidence in the pack—and in future packs—is lost. When marketed, onions should be dressed for size and graded for uniform quality. Small bulbs should be separated and marketed as picklers. The bulbs are usually marketed in units of 56 lb, packed in returnable half bags or non-returnable nets, each bag securely tied with wire or string. Onions are susceptible to bruising, and therefore require careful handling: early bruising can have a cumulative effect, leading to more serious damage at a later stage in distribution. Weights are also important. Correct weight and uniform quality gain a reputation at the market.

## Marrowstem Kale for Silage

F. C. COLLINS, F.R.I.C.

*National Agricultural Advisory Service, South-eastern Region*

What are the snags and advantages of marrowstem kale silage? Mr. Collins records, and comments on, the experiences of a Hampshire farmer who has tried it.

ON many farms kale is best used by grazing or cutting and carting to stock while soil and weather conditions permit, but any surplus can be ensiled in October, rather than left to waste and cause cultivation difficulties. Unfortunately, there are farms on which soil and weather conditions permit only a very short kale-grazing period, and cutting and carting soon become difficult or impossible. On these farms, when labour and equipment are available, kale silage can have a most useful place, particularly if other winter feeds are scarce. Benefits which can accrue from ensiling kale rather than grazing it on wet and heavy land are:

1. The animals' feet are less subject to damage.
2. Energy (and consequently food) are not wasted by the animals wading in stiff mud.
3. Animals keep cleaner, and less labour is involved in cleaning dairy cows before milking.
4. The wastage of kale can be less than if it were grazed.

On any farm, ensiling at least part of the crop could free land early for the sowing of winter cereals.

This article deals mainly with fully-grown kale for silage, but there may well be a place, in some instances, for growing kale and cutting it young for ensiling—sowing in July, say, after an early harvested crop, for cutting in October at latest. Immature kale with very thin stems does not need chopping, and the principles involved in ensiling it are similar to those involved in making silage from other crops.

The stem of marrowstem kale contains about 10 per cent dry matter, and about half of this is made up of simple sugars. The whole plant contains 12–15 per cent of dry matter, of which 12–20 per cent may be crude protein, depending on the proportion of stem to leaf and the amount of nitrogenous fertilizer applied to the crop.

The size of the plants in a kale crop depends to a great extent on the density of plant population and the fertility of the soil. Plants in an unthinned crop on good and well manured soil can reach a height of 3–4 feet, with stems  $\frac{3}{4}$ –1½ inches thick. On the same soil, singled plants might achieve a height of 5–6 feet, with stems 2–3 inches thick near the ground. The feeding value appears not to be affected by the size of the plant.

Because plants in a singled crop grow so big, they require hand-cutting and are unsuitable for ensiling. Nowadays, however, most kale crops are unthinned, and the plants are of a suitable size for silage-making. If sown between the end of March and the end of June, a fully-grown crop is available from August until after Christmas. If the crop is kept into January or February there is danger of severe frost damage, which will impair its palatability and its feeding value.

Forage harvesters have overcome many of the difficulties in handling forage crops. These machines, manned by one person, will cut, chop and load the crop into a trailer in one operation. The more progressive farmers have realized that with the use of such machinery some of the difficulties associated with using kale as a stockfeed can be surmounted.

In the autumn of 1958, Mr. MacWilliam, of Hinton Manor, Catherington, in Hampshire, made marrowstem kale silage with the aid of a forage harvester instead of the binder and cutter-blower which he had used for many years. A great deal of time and labour was saved, and the resulting silage was of excellent quality, with an unusually small amount of external waste. He made kale silage by the same method in 1959. An article on his methods appeared in the agricultural press in January of that year<sup>1</sup>; many farmers who read it and others who have visited his farm have shown a fresh interest in making kale silage.

### *Ensiling fully-grown kale*

The principles involved in making kale silage are broadly the same as in other forms of silage. Cutting is best done when the crop is dry: a lot of rainwater on the crop increases effluent losses when it is ensiled. If the crop *must* be cut wet, care must be taken to get it clean. Silage which is heavily contaminated with soil is not palatable. When a forage harvester is used, such contamination is much less likely than when a binder or mowing

machine is used. The crop should also be clean in other respects—free from weeds or dead leaves.

The characteristics of the silo itself are most important. There must be free drainage, and the bottom layers of silage should never be allowed to stand in a pool of juice which cannot drain away. A well-drained, walled silo built under a roof provides excellent conditions for making any form of silage, but any type of well-designed silo, adequately protected against rain, should serve. The unprotected mound of material in a field or in the farm-yard will almost certainly give unsatisfactory results.

There are, however, some important differences between making silage from maincrop kale and making it from very young kale (which does not need chopping) and from other crops. In the making of most other forms of silage, including young kale silage, it is desirable—often imperative—to let the first layer of material laid down in the silo generate some heat. It is also necessary to consolidate the material, to exclude as much air as possible.

When making silage from chopped or lacerated kale, however, it is undesirable to allow the initial layer to heat up; the kale, chopped or lacerated, should be put into the silo as quickly as possible once silage-making starts. No molasses or other additives are necessary. Lacerated kale requires no consolidation in the silo although, of course, a small amount of treading during filling is unavoidable. Consolidation would press out a considerable amount of juice, which contains valuable nutrients. Even when merely chopped, kale needs very little consolidation, and that should be confined to the sides of the mass, treading being sufficient. Under these conditions, temperature rises in the silage are quite small. In October/early November, when kale is ensiled, air temperatures are usually low and there may be a tendency towards morning frosts. Because of this, it is safer in some parts of the country to ensile before November; frosted kale should not be ensiled.

Mr. MacWilliam does not make his silage in layers. He builds up the lacerated kale to a height of about ten feet at the closed end of the silo, and then works forward until the silo is full. Tipping trailers bring the lacerated crop from the field to the silo, and tip the material where it is required for the lower levels. Filling at the higher levels is done by tipping slowly on to an old sack elevator, the material being carried over and dropped on to the platform made by direct tipping. This system considerably reduces the amount of labour necessary for hand-forking in the silo. With the aid of the driver of the tractor bringing in each load, one man can cope with all the hand-forking which is necessary. As the lacerated kale settles during the filling of the silo, more is forked on top. On Mr. MacWilliam's farm, two tractors and tipping trailers run a shuttle service between field and silo.

Sealing is not needed when lacerated kale silage is made under a roof. A slimy film about 1–2 inches deep forms on the surface and dries and hardens, forming a very effective seal against the atmosphere. Chopped kale may not form a similar film so readily, but still needs no covering.

### *Dry matter losses*

It is difficult, if not impossible, to assess dry matter losses accurately on a particular farm. Work done at the National Institute for Research in Dairying, under controlled conditions, indicates that such losses during the ensiling

of kale are of the same order as those encountered in ensiling grass—not about twice as heavy, as was once thought. Depending on the care taken in making the silo, cutting the crop and ensiling it, the losses can be about 30 per cent of the crop dry matter if the work is well done, or as high as 50 per cent under less favourable conditions.<sup>2</sup>

Part of the dry matter loss from ensiling kale is in the form of effluent. It has been shown at the N.I.R.D. that the effluent loss from unconsolidated chopped kale silage amounts to about 6–8 per cent of the total crop's dry matter. Losses from lacerated kale silage are probably similar, if not a little higher. A sample of effluent from freshly lacerated kale silage examined recently in the N.A.A.S. laboratories at Reading contained 4.8 per cent dry matter, its composition being 48.3 per cent sugars (expressed as glucose); 19.6 per cent crude protein; 14.7 per cent soluble mineral matter; 7.6 per cent siliceous matter and 9.8 per cent undetermined constituents.

There are no real snags in making the silage if the "rules of the game" are followed, but:

1. Labour and equipment costs may not, under the circumstances prevailing on a particular farm, justify making silage of kale. This is particularly so where grazing kale presents no difficulties and fits into the farming system.
2. Kale silage, like some other forms, can taint milk, if fed immediately before or during milking. It is better fed afterwards.

### Feeding value

Well-made kale silage has a feeding value similar to that of the crop from which it is made, but it is generally considered that fresh kale gives better results. A sample of silage made from lacerated kale (analysed in the N.A.A.S. laboratories at Reading) contained 13.4 per cent crude protein in the dry matter, 17.1 per cent dry matter, and had a pH value of 3.9. A sample of the kale from which this silage was made contained 14.9 per cent crude protein in the dry matter, the dry matter itself being 12.65 per cent of the cut crop.

Thirty to thirty-five pounds of the silage would provide sufficient nutrients for a gallon of average quality milk; about 60 lb, together with 14 lb average quality hay, would meet the requirements of an 11 cwt cow for maintenance and one gallon of milk.

Although this article has been written with the marrowstem variety of kale primarily in mind, the thousandhead variety may be used equally well for silage-making. The feeding value of thousandhead kale silage is similar to that of marrowstem kale silage and the mechanics of making both are the same.

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# Herbage Competition in Ley Establishment

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Competition among herbage seedlings has a very great influence on their establishment in a ley. Mr. Eddowes considers the problems, and makes recommendations, after experiments on light and heavy soils in Nottinghamshire and Leicestershire.

SUCCESSFUL establishment of an acreage of leys each year is fundamental to a ley farming system, for poor establishment can only result in low output. Reseeding is expensive and may disrupt cropping plans, and there is too often a tendency to hope that a poor take of seeds will be improved by subsequent management.

Rapid and even germination, followed by vigorous seedling development, depends on many factors, some within the farmer's control, others, mainly seasonal, largely beyond it. Species and varieties of herbage plants may respond differently to local conditions, and hence the resulting sward may not closely resemble the mixture sown. The time and method of sowing, fineness of tilth, and consolidation are of prime importance in relation to the availability of soil moisture and depth of sowing. Competition among the herbage species, grasses, clovers and weeds is a decisive factor.

Under field conditions, plants compete for water, nutrients, space and light, and the ability of any plant to compete during its first year of growth largely depends on its capacity for quick and successful establishment, followed by further rapid growth. Seeds that possess low energies of germination are handicapped in competition with those with high energies. The denser the herbage, the more intense the struggle for survival. Competition between plants starts at a very early stage, and the more slowly developing plants are at a great disadvantage. Very heavy seedings of the latter do not offset this difficulty. In this connection the aggressive Italian and perennial ryegrasses and red clovers readily dominate the less vigorous species, timothy, meadow fescue, and white clover, if allowed to grow unchecked. Stapledon and Wheeler (1948)\* drew attention to the real danger, and no great advantage, of sowing Italian ryegrass as a nurse crop to a herbage seeds mixture. Grazing had to be very hard to keep the Italian ryegrass in check, and prevent its heading and becoming a smothering hay crop—too hard in fact for the good of either timothy or meadow fescue. The level of fertility exercises a large influence on competition between plants, high fertility favouring the better grasses like perennial ryegrass at the expense of bent.

The problem of competition among herbage plants during the establishment period is inherent in the unstable and dynamic nature of newly-sown

\* Influence of Date and Depth of Sowing on Grasses and White Clover. R. G. STAPLEDON and A. WHEELER. *J. Brit. Grassl. Soc.* 1948, 3, 4.



leys. If a complex mixture is used, each constituent may make contrasting demands upon its surroundings, and thus induce instability. For example, a mixture of Italian and perennial ryegrasses, timothy, cocksfoot, red and white clovers is very unstable compared with a simple mixture of perennial ryegrass and white clover. One of the main arguments in favour of simple mixtures is that the sward is stabilized at the designed standard set by the seeds mixture within a few months of sowing. In contrast, complex mixtures evolve more slowly to the designed standard.

Aspects of ley establishment were studied during 1955-57 on light loam at Sutton Bonington, Nottinghamshire, and on heavy boulder clay at Brooksby, Leicestershire. They included comparisons of undersowing with direct sowing; differential treatment of the cover crop; autumn management of undersown mixtures, and the effect of the frequency of grazing on direct-sown leys. In each of these aspects competition between species played an important part, and the results are summarized below.

### *Effect of various treatments on establishment*

Opinions vary regarding the superiority of undersowing in a cover crop compared with direct seeding on bare ground, and the relative advantages of these two methods of ley establishment require no further discussion. The object of the trials was to ascertain the effect on plant establishment rather than the economic implication of the two methods. Replicated plots of both simple and complex mixtures were sown on land either drilled the previous day with spring barley or left bare, all cultivations and fertilizer applications being uniform throughout. One series of replicates was drilled and another broadcast on a ring-rolled surface, and harrowed in. The mixtures were: perennial ryegrass/white clover; a Cockle Park type and Timothy/meadow fescue/white clover.

In each instance, plant counts after harvest showed marked reductions in the establishment of both grasses and clovers when undersown, as compared with mixtures sown direct. This suggests that reduced seed rates may give more satisfactory results when sown direct than when faced with the competition of a cover crop. The results were similar whether the herbage mixtures were broadcast or drilled. Grass and clover establishment was reduced when the seeds were sown at the same time as the cover crop, and it is likely that delayed sowing until the cereal was established would increase the suppression. At the same time, early sowing of herbage seeds may lead to difficulties at harvest through herbage in the straw, particularly in a wet year. In this respect it may be an advantage to delay the sowing of the more aggressive plants such as Italian ryegrass and broad red clover until the corn has braided.

Spring barley was used as the cover crop, and the effects of seed rates and nitrogenous fertilizer top dressings on the undersown seeds were investigated. A seed rate of 3 bushels per acre of barley significantly reduced the establishment of white clover by comparison with a seed rate of  $1\frac{1}{2}$  bushels per acre. Similarly, nitrogenous top dressings to the cover crop at any level reduced the establishment of white clover. They also led to an increase in the establishment of meadow fescue, timothy and cocksfoot, and this was probably because the extra nitrogen enabled the undersown grass seedlings



to compete more successfully with the barley. No lodging occurred, but when undersowing the aim should be to avoid lodging by the choice of a stiff-strawed variety, a reduction in seed rate of the cover crop, and moderation in nitrogenous top dressings.

Such dressings applied to undersown seeds after the cereal had been harvested, at the rate of 2 cwt "Nitro-Chalk" per acre, significantly reduced clover by stimulating the grasses, which gained ground at their expense. The effect was more pronounced on the better developed and more vigorous plants established in the wet season of 1956. Chickweed gained ground following the application of nitrogen to open swards in the dry 1955 season, but was checked in the denser swards in 1956.

Replicated plots of both simple and complex direct seeded mixtures were grazed by sheep for sixteen weeks during establishment, at three stages of growth, corresponding to intervals of two, four and eight weeks respectively after sowing. Hard grazing increased the density of grass tillers and the ground cover of clovers. Combined grazing and topping treatments completely controlled broad-leaved weeds.

Throughout the trials, only minor differences were apparent in the comparative responses of species and varieties to the treatments, for management dominated type. Perennial ryegrass, with its high tillering capacity, more efficiently withstood weed competition than the other grasses.

Clearly, competition among herbage species has a decisive influence on establishment. Many authorities agree that in newly-sown swards this is largely a function of shading. The relatively enormous potential contribution by individual species of grasses and clovers in the absence of competition is illustrated by reference to a spaced plant trial. Species of grasses and clovers sown on 29th April 1957 were transplanted on the square at intervals of  $2 \times 2$  feet on 16th June. By 12th September, plants occupied up to one square foot of ground each. S.23 perennial ryegrass plants had developed 312 tillers each on average, S.215 meadow fescue 193, and S.37 cocksfoot 75.

### *General management*

Herbage seedlings are very sensitive to their environment, and early management should favour rapid establishment. Later the welfare of the sward may be subservient to the needs of the animal, and a well-established ley will then permit greater flexibility in management. In the early phase, sward composition will be determined by the purity and germination capacity of the seed, by differences in the rate of emergence and growth of species, and by their competitive ability.

In making recommendations on ley establishment it is difficult to generalize because of soil variation and seasonal influences, but competition between plants for water, nutrients, space and light is of paramount importance. In this connection, developments in chemical herbicides may facilitate ley establishment.

Delay in undersowing herbage seeds until the corn has braided prejudices the successful establishment of the less vigorous species such as timothy, meadow fescue and white clover, but may be beneficial when vigorous species like Italian ryegrass and broad red clover are included. Lodging of the cereal crop must be avoided as far as possible by attention to variety and

seed rate, and by moderation in the use of nitrogenous top dressings, especially in a wet season. A top dressing after cereal harvest stimulates the development, and enhances the winter survival, of the grass seedlings.

In direct seeding, the evidence suggests that seed rates can be less than with undersowing. Early grazing, supported by topping and if necessary by spraying, should be directed towards quick establishment and weed control. Subsequent hard grazing may improve the ground cover of herbage plants, and promote a quicker fertility cycle in the soil.

Direct seeding has special application in low-lying, wet areas where conditions preclude normal cropping and the problems of ley establishment are increased, and in the drier parts of the country, where valuable species with low powers of establishment may fail outright if undersown.

The subject of seed rates remains controversial, but the evidence supports the modern trend towards reduced rates. Higher seeding rates with Cockle Park mixtures gave an initial advantage in terms of ground cover and number of plants, but this was soon lost. Under good conditions a seed rate of 14-20 lb per acre should be adequate for long leys. Under poorer conditions, and where severe competition from weeds is expected, higher seed rates can be used.

I wish to express my gratitude to Professor J. D. Ivins, University of Nottingham, for his valuable help and advice during the course of this work.

## Gervase Markham

### A Re-appraisal

THOMAS QUAYLE, C.I.E., D.LITT., M.A.

Gervase Markham was a most engaging personality. Perhaps the first outstanding agricultural journalist, he has left us an urbane survey of the rural problems and pleasures of his time.

LOVERS of the Waverley novels may recall the pained astonishment of Diana Vernon, in *Rob Roy*, on eliciting from young Frank Osbaldistone the admission that he had never read, or even heard of, Markham. "Never to have heard of Markham, the most celebrated author on farriery!" she exclaimed, as if utterly unable to believe that she had found someone who could not "shoe a horse, or cut his mane and tail; or worm a dog, or crop his ears, or cut his dew-claws; or reclaim a hawk, or give him his casting-stones, or direct his diet when sealed; or . . ." The young Londoner, obliged to admit his ignorance of all these rural skills, scarcely suspected how heinous his shortcomings really were. There must have been few eighteenth century manors and farmsteads, large or small, without well-thumbed copies of the

writings of Gervase Markham. Continually reprinted for nearly two centuries, their practical utility and enduring popularity well merited the tribute paid to them by Sir Walter Scott.

Born in Nottinghamshire about 1568, Gervase Markham served for a while with the armies fighting in the Low Countries, and he seems also to have held a captaincy under the Earl of Essex in Ireland. Deciding, apparently in his middle twenties, that the pen rather than the sword was his real line, he began to pour out a spate of books. Until his death in 1637, he wrote about horsemanship, veterinary practice, agriculture and horticulture, rural occupations and recreations, archery, military training, housewifery, the epistolary art, and many other themes, not to mention his occasional outbursts of play-writing, and verse, sacred and profane. Many of his books, especially those on his favourite themes, seem to have grown, like the old folk-ballads, by cumulative and incremental repetition. One result has been a bibliographical labyrinth which has not yet been fully explored. His literary permutations and combinations earned him at least a unique niche in the history of the book trade. An entry in the Register of the Stationers Company dated 14th July, 1617, records his promise "hereafter Never to write any more book or bookes to be printed of the Deseases or cures of any Cattle, as Horse, Oxe, Cowe, Sheepe, Swine and Goates &c.". This seems to have been forced upon him by the booksellers, worried about the copies of his previous writings lying unsold on their shelves. But, in the event, his undertaking was more honoured in the breach than in the observance.

### Main works

Pollard and Redgrave's *Short-Title Catalogue of English Books 1475-1640* credits him with seventy-four titles, about a third of which appear to be independent creations. Setting aside for the moment his horse books, and ignoring his miscellaneous writings and translations, his main works include *Cheape and Good Husbandry* (1614), *Markham's Farewell to Husbandry* (1614), *Country Contentments* (1615), *The Enrichment of the Weald of Kent* (1625), and *The English Housewife* (1631). These, whilst continuing to be issued separately, were assembled as the first five parts of Markham's encyclopaedia *A Way to get Wealth* (1631), with a sixth part devoted mainly to horticulture, including *A New Orchard and Garden, etc.* (1618), which is usually attributed to William Lawson, though Markham may have had a hand in it. He wrote about the horse—always his favourite theme—under no less than ten long-drawn-out titles, usually with a foreword dedication in which he insists on the "secrets" and the "experience" they impart or reflect, as if to emphasize the authority with which he writes and the complete novelty of his output. He started his equine studies, and indeed his literary career, with *A Discourse of Horsemanship* (1593), serving up much the same dish in a succession of emended editions up to 1606. A year later, he brought out his first main work, *Cavelarice: or, the English Horseman: Contayning all the Arte of Horsemanship as Much as is Necessary for Any Man to Understand . . .* In 1610, the first edition of *Markham's Maisterpeece: or, What Doth a Horseman Lacke* appeared. In justification of his own proudly expressed confidence in its high value, this seems to have proved his most popular book. Edition followed edition, up to the twentieth in 1723. In 1616

appeared *Markham's Methode or Epitome*, a small manual written for popular reading, and then, as if to maintain and reassert his claim to pre-eminence in veterinary and kindred lore, he published *Markham's Faithfull Farrier* (1620). Apparently about ten years later, though it seems to have been published posthumously, he wrote *The Complete Farrier: or, the King's Highway to Horsemanship* (1639).

In these works, together with *Cheape and Good Husbandry* and *The Enrichment of the Weald of Kent*, we find Markham's agricultural and veterinary knowledge plainly expounded. It was based on his own practical experience, reinforced by what he had learned of value and utility from his wide reading, and usually gave fitting acknowledgment of any indebtedness to other specialists, English and foreign.

### *Interest in stock breeding and animal health*

In the early seventeenth century there is evidence of a lively concern in the problems and possibilities of improved methods of stock-breeding. Markham was keenly interested in this, especially in respect of the horse, "exceeded by none in generosity and serviceability to man". He was one of the first exponents of improved methods of breeding, especially for the race-course. He himself had a stud of valuable horses, and he has been credited with importing the first Arab stallion into England.

*The Complete Jockey*, included in his *Maisterpeece*, and perhaps the earliest work in English on horse-racing, contains Markham's profile of the then ideal type, which should have "the head and legs of a stag, the ears and tail of a fox, the neck of a swan, the breast of a lion, the buttocks of a woman and the feet of an ass". He carefully enlarges on the choice of the best horse for war, state occasions, hunting, racing, and transport. His advice for keeping the animal in good condition and for diagnosing sickness is clearly set down. Markham had a nostrum for every equine ailment: fever, for instance, could be cured by various roots and herbs boiled in oil with butter added; for bots, he prescribed balls of herbs, butter and honey; and for colic, dill boiled in water. All farm stock came within his purview, and he had definite views about the best breeds of cattle, sheep and pigs.

In the *Farewell*, Markham is at pains to outline the husbandman's timetable, day by day and month by month, and he strews his pages with much agricultural lore, embellished with illustrations of such tools as the mattock, the maul and weed-nippers. He carefully assesses what farm labourers and animals might reasonably be expected to do "without hurt", in a day of ploughing, reaping, gathering, delving and ditch-digging, and serves up much practical data of interest and value for the social and economic historian. He is insistent that the husbandman should be skilful in knowing the true nature of soils, and by his deeper treatment of this theme in *The Enrichment of the Weald of Kent* he has some claim to recognition as a pioneer in colloidal chemistry. This twenty-two-page treatise deals with a stretch of barren countryside in Kent and Sussex, wet and sour, useless for tillage or pasturage and in dire need of manure. He recommends deep ploughing, to be covered with five hundred cartloads of ten or twelve bushels of marl to the acre. The Weald could then be sown to oats or peas, or summer-fallowed, and then put under wheat. In all this Markham appears in the triple role of

philosopher, scientist and practical farmer. It is his confession of faith in the good earth, his countryside creed, simply set down for the good of his fellows, and for the long generations of sowing and reaping that were to follow.

Besides handing the tools to the countryman and telling him how best to get on with the job, Gervase Markham zestfully reminds him, under the enchanting title *Country Contentments*, of the recreations of rural life and how best to enjoy his leisure. Here he is very much at home, as he tells how to build up and maintain a worthwhile pack of hounds, to train, feed, and discipline hawks, and to excel in bowls, baloone and tennis. He writes lovingly and with expert knowledge about the whole art of angling, and about wild-fowling and cock-fighting.

Towards the end of the reign of Queen Elizabeth I, the population of England and Wales was about four million, more than four-fifths of whom lived in rural areas, while all, rural and urban alike, lived mainly by or through agriculture. Tudor and Jacobean England was a green and pleasant land, with a new, literate public avid for information and guidance about their activities. Gervase Markham must have known that a stable and assured market for practical books on country pursuits and pastimes was there for the writing.

### *His place in agricultural literature assured*

Walter Harte, an eighteenth-century writer on both agriculture and history, seems to have had no high opinion of his predecessor. In his *Essays on Husbandry* (1764), he refers disparagingly to Gervase Markham as a "hackney writer", and the epithet has led to his being dubbed and regarded as the first English hack-writer, with only one toe in literature. It is true that Markham wrote too much, but he has been unjustly pilloried. At no time was he employed to do dull, tedious work, nor was he given to turning out inferior stuff or using his pen in any form of literary drudgery. He was, in fact, a cultured country gentleman, no mean scholar, well read in modern and classical literature, and a notable linguist, with a fluent command of French, Dutch, Italian and Spanish.

In every age, the great achievements in literature, art and science inevitably overshadow the work of a great company of smaller men, who yet have their own contributions to make to the history of ideas and the advancement of knowledge. Among these humbler craftsmen, Gervase Markham has his own assured place. With his questing, probing mind, allied to firm qualities of conception and execution, he bears in his own chosen sphere and within his personal limitations the imprint of the spacious times into which he was born. He is entitled to greater credit than he has yet received for his surveys and expositions of the agricultural conditions and methods of his day, as well as for his modest contribution to the exuberant outburst of scientific inquiry in the seventeenth century. If, now and then, he lays himself open to a suspicion of quackery, it would be fairer to accept him as an amateur scientist, with a vision, sure, if dim, of the shape of things to come when agriculture was to welcome the chemist, the biologist, the geologist, and the veterinarian as its almost indispensable allies, whose researches and conclusions would revolutionize its theories and practice.



He has a claim to remembrance for another reason. Although his works were never intended for a purely literary audience, their plain, direct style, typical of the popular literature of his age, was to have a significant influence on the development of modern English prose.

From a study of his works, the impression of a vivid, vital personality clearly emerges. We must not expect to find in his pages any sentimental feeling for the beauty and expressiveness of the animal world, or, always excepting the horse, of its sociability with man. Long years had to pass before the imaginative mingling of art and science, the recorded store of observations of outdoor sights and sounds, were to find their first notable expression in such classic writings as Gilbert White's *The Natural History of Selborne* (1789). Yet Gervase Markham, steeped in the atmosphere and lore of the countryside, is not entirely without claim to inclusion among those who have both watched and listened. He may fitly be saluted as perhaps the very first of the outstanding "journalists", whose speciality has been a personal and humanistic survey of rural problems, perplexities, and pleasures.

## Turkeys under Discussion

The ninth Conference of the British Turkey Federation was held at Eastbourne on 1st-4th February 1960.

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NINE years ago the newly-formed British Turkey Federation held its first Conference at Harrogate. About 120 members were present and the papers presented were mainly remarkable for the manner in which they demonstrated the extremely limited knowledge of the members over both production and marketing. Anyone present at the Eastbourne meeting could be forgiven for failing to recognize in that mature body any signs of the bemused infant which came into being nine years ago. To the energy and statesmanship of its "parent", MR. RUPERT CHALMERS WATSON, who was largely responsible for founding this organization, must be attributed a great deal of the successful growth of the Federation. His nine years' service as chairman was very rightly recognized at Eastbourne by the presentation of portraits of both Mr. and Mrs. Chalmers Watson by fellow members.

The main theme of this year's conference was the further expansion of turkey production in the United Kingdom, and the impact of increased output on the individual turkey rearer. It should be stressed that during the last nine years the turkey population of England and Wales has risen from just over one million in September 1957 to about 3½ millions in 1959. It was stressed by one speaker—MR. MATTHEWS—that most of the papers presented dealt with methods of increasing production; what was also needed was the profitable disposal of an increased output. And on their future policy there was divided opinion among delegates.



*Looking at the market*

On the one hand, Mr. G. SYKES had on the opening day urged close co-operation and the formation of "groups". This argument in favour of "agribusiness" has been developed by Mr. Sykes on many occasions, and to some extent is already an established feature of the broiler business in England. Mr. Sykes argues that few farmers will, in the future, be allowed the luxury of deciding their own farming programme and ceasing to have further interest in their products beyond the farm gate. He maintains that to remain in business it will be essential for them to take an interest in all those products which are sold throughout the entire chain, from production to the final retailing. This opinion is based on Mr. Sykes's view that the housewife will demand, to a rapidly increasing degree, foodstuffs requiring the minimum of preparation and, as agricultural production rises, there must be increasing competition for her choice. Since few turkey rearers can be expected to rear, process, pack and market in sufficient quantity and over a long period, some form of co-operation is essential. Mr. Sykes also pointed out the savings and ability to sell at a profit with a lower price accruing to members of a "group" who control their own breeding, processing and distribution units in addition to rearing the birds.

Mr. Sykes is regarded as the *enfant terrible* of the poultry industry, and there are few who can compete with him in the introduction of novel and provocative ideas—all put over with overstatement and in a deceptively stimulating manner. But many of his central ideas are sound common sense and, to judge from the audience reaction, the idea of "agribusiness" drew reluctant agreement from many present.

The idea of the "group" organization formed the subject of a debate on the second day of the conference. It must be recorded that the motion in favour of "groups" was lost, but in my opinion the "noes" sounded rather defiant and fearful, and the reaction was one based more on sentiment than hard-headed conviction. Those opposing the motion stressed the importance of sturdy independence and the long period over which the farmers of this country have exercised their stout-hearted individuality. No doubt this sentimental appeal was effective on this occasion, but it was no real answer to the points made by Mr. Sykes and those who supported the motion.

Those who were more long-sighted over future prospects pointed to the increasing interest of the large multiples in the quality and grading of the products they sold. If turkey and chicken are to figure in the supermarkets and self-service stores as established staples, then grading and packaging become all-important. The product must be tailored to satisfy the housewife. And if the individual cannot do this, then it was held that the retail firms would enter the production and processing fields themselves—as, indeed, some are already doing. It was this angle—that of market promotion—which concerned the supporters of "groups", for if increasing supplies of turkeys are to be produced, then their profitable disposal makes first-rate grading and packing essential.

*The right kind of bird*

Turning to the production side, the new chairman, Mr. W. A. MOTLEY,

in his opening remarks, pin-pointed some immediate and urgent problems facing the turkey industry. Mr. Motley stressed the need to reduce mortality; in his opinion this was as high as 17 per cent from day-old to maturity stage. He also urged a more scientific and more ruthless approach to breeding and, finally, an intensification of earlier selling and cold storage for the Christmas trade. On the last point, Mr. Motley and others emphasized that early selling by members of the Federation, together with better publicity, has led to the avoidance, in 1959, of all too frequent panic stories of shortage or surplus in spite of an all-time record in home production of turkeys that year.

Mr. Motley's comments on the need for better breeding were later underlined by Dr. CLAYTON of the Institute of Animal Genetics. It has been apparent for some time that turkey breeding has lagged behind breeding techniques for hen production. Dr. Clayton pointed out that the aim of the turkey producer is the joint one of producing a large number of poults and birds of the right conformation. Since these two factors seem to be negatively correlated to some extent, the breeder with one strain tends to find progress in one field offset by losses in the other. Dr. Clayton's method was to follow the system adopted many years ago by the old-time producer of high-grade roasting chicken—with a number of important additions. The basic idea was to produce separate male and female lines. In the former—the male line—greatest attention would be directed to growth and conformation, with the realization that reproduction might suffer. The emphasis in the female line would be upon egg numbers and consequently large numbers of poults. Dr. Clayton referred to the use of both artificial insemination and controlled lighting as means of overcoming fertility and reproduction problems.

Artificial insemination is now widely used among turkey breeders; indeed it is virtually essential for breeders concerned with the broad-breasted varieties. It is worth digressing to mention in this connection that there does seem to be a need for fundamental research on fertility in turkeys, for it appears more than likely that low fertility in the broad-breasted varieties is correlated with something more than physical difficulties. An interesting and excellently illustrated talk on A.I. with turkeys was given by Mr. THUMIN, the Chief Poultry Instructor in the Israeli Ministry of Agriculture. Some of the equipment used for retaining the stag, and described by Mr. Thumin, seems capable of widespread use in this country and, judging from the large number of questions to which Mr. Thumin was subjected, it would appear that the paper would well justify publication in order to allow study by a wider audience.

### *Hygiene and disease*

Disease was tackled on two fronts, and it is indicative of the rapid rise in the consumption of turkey meat and the foresight of the leaders of the turkey industry that one paper was devoted to "Hygiene Considerations in Processing Turkeys". It is significant that the speaker, Mr. MORLEY T. PARRY, was a member of the Ministry of Health. The significance arises from the recent developments in the U.S.A. which have been noted by members of the British turkey business. In the U.S.A., because of the rather easily aroused fear of disease contracted through contaminated food, the popularity of a number

of foodstuffs has gravely suffered through reports of unhygienic conditions at processing plants and evidence of disease in the carcasses handled. In recent months, reports in the press here have referred to critical comments on the conditions at certain poultry slaughter centres in this country by officials concerned with public health, while the sharp decline in the popularity of duck eggs in recent years is sufficient evidence of the rising interest of the consumer in this aspect of our diet. The British Turkey Federation have taken time by the forelock and are already endeavouring to ensure that their processing centres can stand up to criticism—hence the keen interest in Mr. Parry's address. And what could have been a series of precise statements on precautions relating to equipment and processes was a highly instructive but equally amusing talk delivered in a racy manner. Mr. Parry very skilfully pin-pointed each essential step by a humorous anecdote, and doubtless ensured that many of his hilarious yarns will also stimulate remembrance of his technical points.

On the subject of disease and production, Mr. E. G. HARRY gave an authoritative account of the preventive and curative treatments to be adopted. It is, of course, a matter of significance in connection with the trend towards intensive methods of poultry keeping that interest is increasingly directed towards respiratory, airborne, and litterborne diseases. As the methods of management have changed in the last decade, so have the importance of certain diseases. And fortunately, new weapons against these troubles have been developed.

### *Work study*

One very new weapon in the poultryman's armoury to defeat rising costs is "Work Study". This subject was discussed by Mr. G. W. LUGG, of Lugg, Gould and Company. For many of those present it was the first occasion on which they had had an exposition on this new technique, and the speaker undoubtedly faced a highly sceptical audience. But with Mr. Lugg's excellent account of the application of work study techniques aided by the clarity of his illustrations the opposition soon melted away. From the tenor of the questions, and the private discussions which followed, it is without any doubt that Mr. Lugg left his audience "sold" on work study with one of the finest addresses of the entire conference.

The remaining papers at the conference dealt with the all-absorbing problem of raising money, while the "other chap's" ideas were described by PROFESSOR KRATZER of the University of California, who gave an account of some American methods.

This was all—except for the prolonged *post mortem* discussions in the bar and lounge. And, without disrespect to the speakers and the high order of their talks, many of these evening chats were as intriguing and as instructive as the daily sessions—particularly when spiced by the half-ashamed account of what "went wrong" in the past.

It is intriguing to speculate on the reaction of the members of the British Turkey Federation if these papers had been presented at their first conference in 1952. The measure of bewilderment and contempt with which at least half of them would certainly have been received in that year is a measure of the progress which this young but energetic association has achieved.

## 23. North Hertfordshire

D. M. O. JONES-DAVIES

*District Advisory Officer*

NORTH HERTFORDSHIRE is bounded by Bedfordshire on the west, Cambridge-shire to the north and Essex in the east, and extends south roughly to a line drawn across the map from Bishop's Stortford to Luton. Between thirty and thirty-five miles wide, and twenty to twenty-five miles from its most northern point, Royston, to its southern boundary, it covers about 120,000 acres of farmland, out of a total of 277,000 acres of such land in the county as a whole. It is therefore by far the biggest of the three farming districts into which the county is divided.

Within these 120,000 acres, the soils range almost from one extreme to the other, with light chalk in the north and west and the heavier boulder clays near the Essex borders. There are heavy silts in the north of the parishes of Hexton, Pirton, Hinxworth and Ashwell, and to the south are the gravels round Knebworth. There are also some comparatively small areas of good, deep loams, and even a smattering of "fen" soils along some river margins, which are extremely productive under arable cultivation once the problems of trace element deficiencies have been overcome.

The dominant soils of the district are the heavy loams, overlying the London and other clays. Drainage, especially mole drainage, is therefore important. Much of the land is still benefiting from the deep and well laid tiles of the late nineteenth century, and in such cases it is often only a matter of repairing the existing system where it has broken down at isolated points and given rise to wet patches.

Fortunately most of the neglect of the ditches and hedges in the late 'twenties and early 'thirties was overcome by gang labour towards the end of the last war. Nevertheless the hedge-cutting machines developed since then have greatly helped in maintaining the miles of hedges in the area. Farmers are also keeping a watchful eye on the new ditching machines being evolved, and are only awaiting their simplification and increased reliability before adopting them more widely.

This being chiefly an arable area with a fair proportion of medium-sized farms and some over 1,000 acres, cereals are the main crops, with barley covering the greatest acreage. Oats are declining yearly because barley and wheat now give higher returns per acre, and suffer less from pests and diseases, of which cereal root and stem eelworm are the worst.

Potatoes are now largely confined to the better soils, where crops of at least eight tons an acre can be grown regularly. Farmers are realizing the necessity of setting at least 10-12 acres; and many also appreciate the value of the potato crop in breaking the cereal rotation, and for this reason alone are loath to drop it completely.

Sugar beet is more or less limited to the heavier soils of the district, and more particularly to those approaching the Essex borders, where skilled labour is available and transport charges to the factory are lower.

One-year arable hay mixtures are the usual break on the cereal farms, although three-year leys play a large part, especially where dairy herds are run in addition to arable farming. The larger and more progressive farmers have shown considerable interest recently in herbage seed production to help in their rotation, especially where there are some stock on the holding to use the by-products. They find, too, that this crop lends itself to mechanization. But it is too slow to rotate round the medium-sized farm and the smaller farmer must look for other crops to break his rotation.

Brussels sprouts have proved useful, particularly in those parts of the district which border on the market-garden areas of Bedfordshire, where the knowledge and skilled workers for growing the crop are available. Sprouts also help the cereal farmer as a cleaning crop, from both the weed and cereal disease points of view. They employ labour during the winter months, and are a high cash crop, grossing anything between £40 and £180 an acre. But they do need generous treatment in all respects, in selection of variety and strain, cultivations, manuring, insect pest control and marketing, and therefore they are not a crop to be indulged in lightly by the half-hearted.

In passing, mention should be made of the menace the pigeon has become, especially to sprouts and clover. Untold damage can be done in a comparatively short time and in quite mild weather. Organized pigeon shoots have done little to reduce the anxiety of the farmers growing these expensive crops.

The district used to suffer badly from the rabbit, and myxomatosis has increased the yields of many cereal crops in areas once heavily infested. Nevertheless, rabbit numbers need watching even today, since there is no doubt that they are on the increase again.

North Hertfordshire is conveniently close to the markets, especially London. This is particularly true for the Brussels crop; sprouts picked today are comfortably on the salesman's stand next morning. The corn trade has grown up with the extensive arable acreage and, as the district adjoins the extensive cereal acreages of the eastern counties, competition holds the market steady without undue transport costs. For cattle the area is well served with markets at Luton, Hitchin, Royston in a small way, Bishop's Stortford and Hertford. Pigs also benefit from these auction marts, but in addition there are bacon factories at Hitchin and Letchworth which cover the western part of the district, while farmers on the eastern extremes have the further choice of Dunmow.

North Hertfordshire, then, provides a great variety of interest from the adviser's point of view, and is a lovely countryside in which to live and work.



## At the Farmers' Club

# Land Drainage

We should have an efficient tile drainage system in every field that is not naturally self-draining, for it is impossible to farm successfully on water-logged land. This was the theme of Mr. RAYMOND CAUDWELL'S talk to the Farmers' Club on 10th February.

"I realize that there are many who may feel that drainage is an enormous expense and, even if they know it to be justified, do not always feel that they can afford it," he said. "But today a properly run farm shows a reasonable return. We also have Government grants of 50 per cent on all field drainage work, and we still have a high level of taxation on profits. Was there ever a time when we could put our drainage system into perfect working order at such little cost to ourselves? After deduction of the grant and tax allowances, the actual cost to the farmer is only about 25 per cent of the original expense. I am absolutely certain that efficient land drainage at this price is a first-class bargain."

Speaking as a practical farmer, with personal experience of draining about 4,000 acres of arable land on his own 5,000 acre farm during the past ten years, Mr. Caudwell described in detail how to set about getting surplus water away from the soil surface and into the sea as quickly as possible. The soil must be kept free enough to let water pass through it into the under drains; these must be properly laid and maintained, so that the water can flow as directly and independently as possible into the farm ditches. In turn the ditches lead via the main drains to rivers flowing into the sea. Every link in this chain must function properly if the drainage is to be effective. Generally the drains and rivers are maintained by the Internal Drainage and River Boards, but the under drains and farm ditches are the farmer's responsibility.

Great care should be taken to avoid packing the soil. A subsoiler is very helpful in avoiding a plough pan in arable fields. Water penetration in grass-land is easily promoted by the use of a pitch pole harrow or some such tool. But, said Mr. Caudwell, the biggest single factor in assisting water to move through strong land is a hot dry summer; the effects of the past year will be apparent for several years to come.

The mole plough should be used only on really strong land that has no seams of gravel, lighter sands or silt. "Nearly 70 per cent of the work done by a mole plough is quite useless within three years, as the moles may fill with lighter sand or silt." Moling about one foot down, at right angles to and above any existing tile drains, will help the water to get into these more quickly; but where ploughing to twelve or fifteen inches is possible, a heavy plough with a subsoiler attached to every other furrow, and set six inches deeper than the plough, will achieve the same results more cheaply.

Trials of tile drains laid with a continuous concrete lining suggest that they may be cheaper than conventional methods. From America, success is reported with continuously-laid perforated plastic pipes. Mr. Caudwell said he

had no personal experience with these. But on tile drainage he gave much useful first-hand information about Lincolnshire practice.

Up to about ten years ago nearly all grips (the Lincolnshire word for trenches) were cut out 2½-3½ feet deep, and the tiles laid by skilled men using long, narrow, hand spades called gouges, with 24-inch blades. Now, except on some lighter soils, mechanical excavators do the work more cheaply, and operate to a depth of four feet. A range of machines is available, including a rotavator with an output of four chains an hour, which Mr. Caudwell said he had used very successfully. But it is still most important, he added, to ring each tile to test for cracks before placing it on the machine, and each trench should be inspected and tested with water before it is covered.

A covering of gravel, small chalk, clinker, foam slag or even straw, to within about fifteen inches of the soil surface, greatly increases the efficiency of all land drains.

"I am not very keen on mains with a lot of smaller pipes connecting them," declared Mr. Caudwell. Blockage anywhere in the main, which is very difficult to detect, puts the whole drainage system above this point out of action. But when each drain has its own outfall it is immediately apparent if anything goes wrong, for the drain ceases to run.

The new drainage system should be put in deeper than any existing system, and at right angles to it, so that the old drains help feed the new ones. Wherever possible the trenches should run diagonally across the slope of a field, not down it. On medium silt land, a 15-yard spacing and a depth of 3½-4 feet will be satisfactory. On strong clay, the drains should not be more than 7 yards apart and probably not deeper than 2½ feet; 14-yard spacing, using a mole plough or subsoiler to assist water movement, would be cheaper. Plans showing the exact positions of each trench and its outfall are essential for obtaining Government grants.

Before beginning any drainage system, it is vital to clean out farm ditches and grade them to the outfalls at which they meet the main drains. Mr. Caudwell recommended keeping ditches deep enough to allow at least a 6-inch clearance below the lowest trench; a 15-inch bottom; and for a normal 4-foot ditch at least a 9-foot top. "No farm ditch should be smaller than this." Hedges add considerably to ditch maintenance costs, and should be planted well back if considered really necessary.

Regular inspection and careful maintenance are essential to keep the drainage system in good working order. Given care, a well-laid tile system should last several generations. "Remember," Mr. Caudwell concluded, "there is no field impossible to drain. If I have managed to persuade just a few of you to go home and drain just one of your wettest fields, then our afternoon together has been well spent."

Sylvia Laverton

## THE MINISTRY'S PUBLICATIONS

Since the list published in the February 1960 number of *AGRICULTURE* (p. 523) the following publications have been issued.

### MAJOR PUBLICATIONS

*Copies are obtainable from Government Bookshops or through any bookseller at the price quoted.*

#### BULLETIN

NO. 149. FARM GRAIN DRYING AND STORAGE (*Revised*) 7s. (7s. 7d. by post)

Gives advice on all aspects of drying and storing grain drawn from experience and experimental work. The subjects discussed include the choice of drying systems, planning installations, storage structures and ancillary equipment.

#### OTHER PUBLICATION

AGRICULTURAL STATISTICS, 1957-58, ENGLAND AND WALES (*New*) 8s. 6d. (9s. by post)

### LEAFLETS

*Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Surrey. Copies beyond this limit must be bought from Government Bookshops, price 3d. (5d. by post).*

#### ADVISORY LEAFLETS

- No. 25. Vapourer Moth (*Revised*)
- No. 34. Plum Aphids (*Revised*)
- No. 109. Flea Beetles (*Revised*)
- No. 165. The Wood-Pigeon (*Revised*)
- No. 199. Wireworms (*Revised*)
- No. 238. Tomato Spotted Wilt (*Revised*)
- No. 347. Beeswax from the Apiary (*Revised*)
- No. 440. Stem and bulb eelworm on Vegetables (*Revised*)
- No. 475. Cucumber Growing (*New*)
- No. 477. Chemical Weed Control in Onions and Leeks (*New*)

#### FIXED EQUIPMENT OF THE FARM LEAFLET

- No. 42. Round Timber from the Farm (*New*) 9d. (11d. by post)

### FREE ISSUES

*Obtainable only from the Ministry (Publications), Ruskin Avenue, Kew, Surrey.*

Crop Protection Products Approval Scheme: Approved List 1959-60.

## In Brief

### FARMING ON THE CHALK

Speaking about chalkland farming at a recent conference in Salisbury, organized by the N.A.A.S. in conjunction with the Fertiliser Manufacturers' Association, Mr. D. T. Cave of Everleigh, near Marlborough, Wilts, said that with the three-year ley as a break he is now growing five and six high-yielding corn crops in a row without impoverishing the soil. Soil depth is increasing, whereas under the old one-year ley system it had diminished. An essential point is intensive management of the three-year ley. In the autumn following undersowing, it is grazed and given half a ton of slag per acre. It never pays to leave a patchy take; far better to plough again and leave an older ley for another year.

Besides being grown on a big scale for drying, lucerne has become an essential crop for his three 120-cow dairy herds, generally allowing about one-third of an acre of lucerne per cow. Producing up to 5 tons of dry matter per acre, it is way ahead of kale, which has now been dropped in favour of self-feed silage and inwintering the cattle. The result has been no mud, no bad feet, and more cows on less land.

Mr. Cave said that maize has also proved an invaluable silage crop over the past three years, again yielding up to 5 tons of dry matter per acre, thanks to the new hybrid varieties such as Pioneer and Caldera. Cotton is the best insurance against birds at planting time, but should there be a failure there is still time to drill kale.

The lucerne is undersown in barley. This is severely harrowed in April to kill any weeds and the lucerne then drilled two ways. The companion grass seeds are broadcast, then harrowed and rolled. The barley recovers remarkably from this treatment and makes an excellent cover crop. The lucerne receives 10 cwt slag per acre the first autumn and 5 cwt potash each winter.

Mr. Cave's favourite ley mixture is 6 lb S.48 timothy, 10 lb meadow fescue, 2 lb S.100 white clover, 10 lb S.22 or Italian ryegrass.

This is far better than ryegrass or cocksfoot for the dairy herds, and the S.22 helps to fill out the first hay or silage cut.

At Everleigh winter wheat produces the heaviest yields—about 40 cwt an acre, using 4 cwt sulphate of ammonia as a top dressing, and it is quite common to follow it with winter oats to break the eyespot cycle, and then go back to winter wheat again. Forty cwt of wheat to the acre has been produced as a fourth straw crop, using 120 units of nitrogen.

The barley crop at Everleigh is entirely Proctor, generously top-dressed with nitrogen: 50 units for a third straw crop, and up to 80 units for a fifth or sixth crop.

Malting quality has suffered when potash applications have been reduced, and now all the barley acreage receives an extra 1 cwt per acre muriate of potash during the previous winter.

Mr. Cave manages without any fallows for cleaning. Most of the straw is burnt the day the combine leaves the field. This allows the tined cultivators to get to work immediately, covering about 11 acres each a day. After several cross-cultivations, the fields are left rough for winter weathering and an easy spring tieth. Only the leys are ploughed. On this system there is less and less use for crawler tractors, but there is a place for a 80 h.p. wheeled tractor.

Mr. Cave makes it a rule to turn all corn in bins immediately after harvest to obviate any damp spots. He has also fitted conveyors with a capacity of 10-12 tons per hour, which do away with the need for bulk delivery storage.

R. E. Rogers

## IN BRIEF

### U.K. A MAJOR MEAT PRODUCER

According to estimates produced by the U.S. Department of Agriculture, the United Kingdom's production of approximately 1½ million tons of meat in 1958 makes us the third largest producers in Europe. Only the French and West German meat outputs stand higher than ours. We also learn from the following table that our production is more than double New Zealand's and almost a quarter greater than Australia's, and that while our beef production is high, our lamb and pork production are relatively much higher than in many other lands.

	Beef and veal	Pork and bacon	Mutton and lamb	Total meat production
	<i>thousand tons</i>			
United States	6,500	4,700	300	11,500
U.S.S.R.	2,100	2,500	900	5,500
Argentina	1,900	190	110	2,200
Brazil	1,400	490	40	1,900
France	1,230	1,000	120	2,400
West Germany	960	1,620	20	2,600
United Kingdom	820	740	190	1,700
Australia	850	100	450	1,400
New Zealand	260	40	330	600

### FIRST BOOK ON INSECTS

The first book ever to be written on insects is a remarkable work called the *Theatre of Insects* (*Theatrum Insectorum*), which in describing these creatures notes many that were pests. Although this was the first book to be written about insects it was not the first published, owing to many delays. The authors were Conrad Gesner, of Zurich, and three Englishmen, Edward Wootton, Thomas Penny and Thomas Mouffet (or Muffet). The manuscript of this book, now in the British Museum, has many remarkable water-colour drawings stuck to it which formed the basis of the woodcuts in the book. The drawings are both beautiful and accurate. Ready in 1589, the book was dedicated to Queen Elizabeth, but it was not published until 1634, being rededicated in the meantime to James I, though all the authors were dead by then, and the king, too. It was written in Latin, the universal language of scientist and philosopher of that day.

Many pests are shown in *Theatrum Insectorum*, such as the cabbage white, the winter moth, the gipsy moth and others. There is an account of what must have been an enormous invasion of maybugs, or cockchafers, for they were so numerous that they choked the waterwheels in the Severn and caused a bread shortage. We certainly see nothing like that today, though maybugs can still be a severe pest in parts of Europe. Mouffet and his fellow authors made an important observation—that insects came from eggs; nevertheless they still seemed to believe that "corruption" bred them as well, and this belief in the spontaneous generation of life persisted down to the time of Pasteur in spite of William Harvey's *omnia vivum ex ovo*.

The extract above has been taken from Mr. George Ordish's informative article "Agricultural Pests in History" published by Shell International Chemical Company in the current issue of their magazine *Span*.

### BUY BEES, NOT DISEASE

Disease can spread rapidly through a bee-hive; honey output will be reduced, and may be cut off altogether by the colony dying out. If you are getting new stocks, buy them from apiaries certified by the Ministry of Agriculture.

This year the Ministry wants more apiaries certified. A full description of the certification scheme (including the scale of charges), and an application form, will be found in a leaflet which can be obtained, free, from the Ministry's Horticulture Division, Whitehall Place West, London, S.W.1.



## Book Reviews

**English Rural Life.** H. E. BRACEY. Routledge and Kegan Paul. 30s.

The sub-title of this book—village activities, organizations and institutions—makes its framework clear from the outset. Because the volume is comprehensive, even encyclopaedic, in scope and treatment, the author must have had a difficult task in writing it.

Any rural area is an amalgam of social and economic activities and institutions, which can appear superficially to be relatively few and clear cut. But if these institutions and activities take place in an old, settled country, with an increasing tempo of general change, and where a large and widely scattered urban population has grown up, the teasing out of the resultant involved picture is likely to be intricate and lengthy.

The book records the changing fabric of rural life in relation to the increasing change in occupations, communications and attitudes to living. A detailed picture has been set against a background of the dominant forces now at work in rural areas everywhere—the quickly increasing mobility and migration of goods, services and people. This has involved the author in brief, but comprehensive, descriptions of many rural institutions and their history, present organization, strains and stresses and the author's own impressions and judgments. These institutions and activities range, for example, from leadership patterns to craft activities, from farming to folk dancing, and from local government to local pubs. No activities of any size are omitted and the factual accuracy of description appears to be very great.

Though at first sight the sections dealing with agriculture appear small, the industry is commented on from many refreshingly different angles, especially in Chapters 1-5 and 18. Agriculture is, in fact, dealt with primarily through the attitudes and activities of the people engaged in it, rather than by a description of its physical and economic structure.

As part of the International Library of Sociology and Social Reconstruction, the book fills a big gap in the written description of modern Britain. It will be useful to

the many who live, or intend to live, in the countryside, and to those who come in contact with country people and organizations in the course of their work or leisure. Because of the author's skill in description and diagnosis, and the concentrated distillation of his wide experience of rural matters, the reader is provided with a valuable mine of information and opinion in a relatively small volume.

G.P.W.

**Farm Rents.** D. R. DENMAN and V. F. STEWART. Allen and Unwin. 27s. 6d.

An important gap in our knowledge of the post-war pattern of agriculture has been the absence of detailed farm rent statistics. To fill that breach, a survey was undertaken by the Department of Estate Management of Cambridge University, and this book presents the results of their inquiry. The survey is mainly concerned with the period 1945-58, and is based on a sample of about one-tenth of the wholly rented holdings in England and Wales, excluding those with less than fifteen acres. It is probably the most comprehensive record of agricultural rents made since the National Farm Survey in 1941-43, and no one interested in the general level and movements of farm rents can afford to ignore it.

The main part of the analysis is concerned with the association between rent and the individual factors which influence it. Among those considered are size of holding, type of farming, the broad provision of fixed equipment, tenancy conditions, rent determination procedure and estate character. National and county rent levels are examined and there is also an interesting account of the cause of rent change, a comparison of the results of the investigation with those of other surveys and a discussion of movements in farm rents, farming net income and the earnings of agricultural workers.

To preserve the impartial nature of the enquiry, the authors have deliberately refrained from pursuing the economic,

## BOOK REVIEWS

social and political implications of their findings. Their policy has much to commend it, as there are vital gaps in the information required to interpret the rental figures in those terms. Nothing is known of the extent of capital improvements and repairs carried out on the sample farms during the years under review, nor of the proportions of such work undertaken by landowners and tenants. Neither is there any detailed indication of the adequacy and condition of the fixed equipment provided, nor of the quality of the land in the sub-groups which are compared.

Some of the analyses need to be studied with particular care; for example, the section on the provision of electricity. Other things being equal, we should expect the average rent of holdings to be higher for those with a supply than for those without and, broadly speaking, the survey confirms this expectation. Yet, for some types of farms, the average rents are shown to be appreciably lower where the holdings have electricity than where they have not. This suggests that the influence of electricity supply is masked by variations in other factors and, hence, that the groups are not strictly comparable. We cannot, therefore, ignore the risk that lack of uniformity in the samples may also have affected the results where increases in rent are associated with the provision of a supply. In general, there is need for caution when interpreting absolute rent margins in terms of individual influences, especially where the samples are small.

As would be expected from the nature of the survey, the report is full of statistics. But this need not discourage anyone, since the tables are straightforward and the text generally easy to follow.

D.J.G.

that this book is designed for them too, that it is no more difficult to use than a telephone directory, and that it is a model of encyclopaedic design.

The alphabetical list of cultivated plants (given under both common and Latin names) includes all the parasitic fungi recorded as causing a disease of any particular host species in Great Britain. In the main section of the book will be found the basic data about any particular parasitic fungus, the diseases that it causes and, by means of a well-chosen and very up-to-date bibliography, where to find further information.

Those chiefly concerned with the control of plant diseases will find what they want to know about the distribution of a disease arranged according to locality, soil and season, and other data of practical value. As Director, since 1949, of the Ministry's Plant Pathology Laboratory at Harpenden, Mr. Moore has been responsible for the collection and co-ordination of this kind of information.

Having taken for granted the statement that this will be an essential reference book for plant pathologists and mycologists, there might appear to be no need to say any more, as Mr. Moore's wide circle of professional associates know well his meticulous accuracy and immense breadth of knowledge. Nevertheless, much more than accuracy and erudition must go towards the compilation of a true encyclopaedia, and one can safely predict that this book will be widely acclaimed as a product of thorough and devoted scholarship in the best botanical tradition. The format is attractive, and this first edition has the added advantage of being nearly as compact as a pocket flora.

S.D.G.

**British Parasitic Fungi. W. C. MOORE.**  
Cambridge University Press. 45s.

No reviewer should preach to the converted, and so there is no need to comment on the first half of a statement on the cover of this book: "This essential reference book for plant pathologists and mycologists will also be useful to horticulturists, agriculturists, and botanists . . .". But it will be a thousand pities if agricultural advisers, other than professional plant pathologists, fail to realize

Wye College Department of Hop Research Annual Report, 1958. 5s.

This report, the eleventh, gives the sad news that Professor E. S. Salmon died on the 12th October 1959, at the age of 88 years. His connection with Wye extended over half a century. He was one of the most colourful and respected of all hop research workers, and his life and work will be the subject of review in the next report.

With the introduction of studies on problems of hop growth a new impetus

has been given to all sections in the department; this "life" is felt throughout the whole very readable report.

The new era in hop breeding, started in 1950, is now showing interesting results. Efforts to produce a wilt-tolerant substitute for the existing Fuggle are progressing steadily—a hopeful sign to the 260 farms now affected by progressive verticillium wilt. The improvement of English and foreign varieties is also receiving attention, the results of which could be of benefit to the whole industry.

In numerous trials, the complex manurial problems are being investigated, and it appears that excessive nitrogen will not only depress the yield, but may adversely affect the process of resin formation in the hop. Also, phosphate applied to hop gardens that already have a high available phosphate content probably has no beneficial effect at all. A field trial, in which the major element deficiencies were studied, describes the symptoms that developed in relation to the relevant soil, leaf and resin analysis data.

The installation of a hop-picking machine, coupled with the re-establishment of the height of wire work and spacing trial, will enable the study of growth problems connected with machine picking to be resumed. This is most welcome now that more than half the crop is machine picked.

Research on downy mildew is devoted mainly to discovering the origin of the primary basal spikes, and to the measurement of the degrees of resistance found in different varieties. Recent developments in mist propagation and growing techniques have greatly assisted this work.

Among the several appendices on matters of general interest is one describing the changes in hop acreage of the

West Midlands during the last 150 years, as compared with the south-eastern region. There has been far less fluctuation in the West Midlands, and the importance of the area has continually increased because of the earlier adoption of quality hops, and further improvement in methods of drying and cultivation.

The efforts of all concerned with the outbreak of progressive verticillium wilt in Wye Field seem to have been successful, and the policy of eradication entirely vindicated.

G.P.C.

#### Books Received

*Principles for British Agricultural Policy.* Edited by H. T. Williams. Oxford University Press. 18s.

*Diet in Relation to Reproduction and the Viability of the Young. Part II. Sheep: World Survey of Reproduction and Review of Feeding Experiments.* (Commonwealth Bureau of Animal Nutrition Technical Communication No. 20.) W. Thomson and F. C. Aitken. Commonwealth Agricultural Bureaux. 30s.

A new edition (1959) of the well-known and highly valued *List of Research Workers*, published by the Commonwealth Agricultural Bureaux, is now available. It comprises the names and addresses (with, in some instances, telephone numbers and telegraphic addresses) of research workers in agriculture, animal health and forestry throughout the Commonwealth, the Sudan and the Republic of Ireland. Price 42s., from any bookseller, or the Commonwealth Agricultural Bureaux, Central Sales, Farnham Royal, Bucks.

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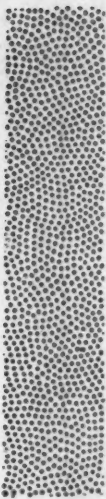
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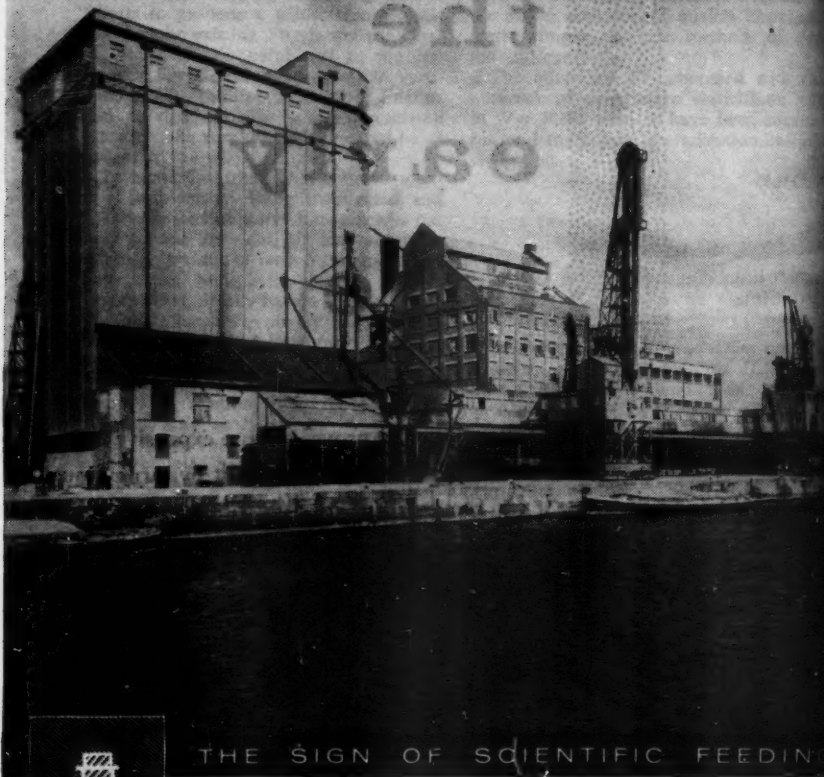
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